

National Spatial Data Infrastructure

FGDC Digital Cartographic Standard for Geologic Map Symbolization

Geologic Data Subcommittee

Federal Geographic Data Committee

December 2005

Prepared by the U.S. Geological Survey for the Federal Geographic Data Committee

Recommended reference:

Federal Geographic Data Committee [prepared for the Federal Geographic Data Committee by the U.S. Geological Survey], 2006, FGDC Digital cartographic standard for geologic map symbolization: Reston, Va., Federal Geographic Data Committee, ??? p., 2 plates.

Federal Geographic Data Committee

Department of Agriculture • Department of Commerce • Department of Defense • Department of Energy
Department of Housing and Urban Development • Department of the Interior • Department of State
Department of Transportation • Environmental Protection Agency
Federal Emergency Management Agency • Library of Congress
National Aeronautics and Space Administration • National Archives and Records Administration
Tennessee Valley Authority

Federal Geographic Data Committee

Established by Office of Management and Budget Circular A-16, the Federal Geographic Data Committee (FGDC) promotes the coordinated development, use, sharing, and dissemination of geographic data.

The FGDC is composed of representatives from the Departments of Agriculture, Commerce, Defense, Energy, Housing and Urban Development, the Interior, State, and Transportation; the Environmental Protection Agency; the Federal Emergency Management Agency; the Library of Congress; the National Aeronautics and Space Administration; the National Archives and Records Administration; and the Tennessee Valley Authority. Additional Federal agencies participate on FGDC subcommittees and working groups. The Department of the Interior chairs the committee.

FGDC subcommittees work on issues related to data categories coordinated under the circular. Subcommittees establish and implement standards for data content, quality, and transfer; encourage the exchange of information and the transfer of data; and organize the collection of geographic data to reduce duplication of effort. Working groups are established for issues that transcend data categories.

For more information about the committee, or to be added to the committee's newsletter mailing list, please contact:

Federal Geographic Data Committee Secretariat

c/o U.S. Geological Survey

590 National Center

Reston, Virginia 22092

Telephone: (703) 648-5514

Facsimile: (703) 648-5755

Internet (electronic mail): gdc@usgs.gov

Anonymous FTP: <ftp://fgdc.er.usgs.gov/pub/gdc/>

World Wide Web: <http://fgdc.er.usgs.gov/fgdc.html>

CONTENTS

		<i>Page</i>
79		
80		
81	1. Introductory Materials	1
82	1.1 Objective	1
83	1.2 Scope	2
84	1.3 Applicability	2
85	1.4 Related Standards	2
86	1.5 Standards Development Procedures	3
87	1.6 Maintenance Authority	5
88	2. Background	5
89	2.1 Relation to Previous U.S. Geological Survey Standards	5
90	2.2 Changes from Previous Standards	7
91	2.3 Preparers of This Standard	9
92	3. Geologic Mapping Concepts and Definitions	10
93	3.1 Geologic Maps	10
94	3.2 Geologic Map Databases	11
95	3.3 Geologic Map Units	11
96	3.3.1 Geologic Time, the Ages of Rock Units, and Geologic Age Symbols	12
97	3.3.2 Map-Unit Labels	12
98	3.4 Planar Geologic Features	12
99	3.4.1 Contacts	13
100	3.4.1.1 Discrete versus Gradational Contacts	13
101	3.4.2 Key Beds	14
102	3.4.3 Faults	15
103	3.4.3.1 Discrete Faults versus Fault Zones	16
104	3.4.4 Folds	17
105	3.5 Linear Geologic Features	17
106	3.6 Geologic Point Features	18
107	3.6.1 Planar-Feature Geologic Point Data	18
108	3.6.1.1 Point Symbols for Planar Features, and Their Placement Relative to Point	
109	of Observation	19
110	3.6.1.2 Specialized Planar-Feature Point Symbols for Multiple Observations at	
111	One Locality	19
112	3.6.2 Linear-Feature Geologic Point Data	19
113	3.6.2.1 Point Symbols for Linear Features, and Their Placement Relative to Point	
114	of Observation	20

115		<i>Page</i>
116	3.6.3 Informational Geologic Point Data	20
117	3.6.3.1 Locality-Information Point Data	20
118	3.6.3.2 Line-Symbol Decorations	21
119	4. Scientific Confidence and Locational Accuracy of Geologic Features	21
120	4.1 Scientific Confidence	22
121	4.1.1 Identity	22
122	4.1.2 Existence	22
123	4.1.3 Levels of Scientific Confidence	23
124	4.1.4 Cartographic Representation of Scientific Confidence	26
125	4.2 Locational Accuracy	26
126	4.2.1 Locatability	27
127	4.2.2 Positioning	27
128	4.2.2.1 Specifying Positional Accuracy with the Zone of Confidence	28
129	4.2.2.2 Accommodating Different Values of the Zone of Confidence	30
130	4.2.3 Levels of Locational Accuracy	31
131	4.2.4 Cartographic Representation of Locational Accuracy	32
132	5. Guidelines for Map Color and Pattern Selection	33
133	5.1 Factors That Influence Color and Pattern Selection	33
134	5.1.1 Purpose of Map	33
135	5.1.2 Age and Type of Rock	34
136	5.1.3 Size of Map-Unit Areas	34
137	5.1.4 Contrast	35
138	5.2 Specifying Color for Map-Unit Areas	35
139	5.3 Use of Patterns	36
140	5.3.1 Overprint Patterns	36
141	5.3.2 Dropout Patterns	36
142	5.4 Specifying Color for Line and Point Symbols	37
143	6. Guidelines for Map Labeling	37
144	6.1 Strategies for Map Labeling	37
145	6.2 Font Selection	38
146	6.3 Type Size and Style	39
147	6.4 Label Placement	39
148	6.5 Leader Placement	39
149	7. Technical Specifications Used in the Preparation of this Standard	39
150	7.1 Units for Lineweights, Lengths, and Distances	40

151		<i>Page</i>
152	7.2 Type Specifications	40
153	7.3 Color Specifications for Line and Point Symbols	40
154	7.4 Color Specifications for Map-Unit Areas	42
155	7.5 Pattern Specifications	43
156	7.6 Geologic Age Symbol Font	43
157	8. Acknowledgments	43
158	9. References	44

159

160

161

162 FIGURES

163		<i>Page</i>
164	1. Diagram Showing Relation of New FGDC Standard Terminology to Historically Used Terminology	
165	and to Traditional Line Symbol Styles	24
166	2. Flowchart Showing Example of Logical Steps That Might Be Used to Determine Appropriate Line	
167	Symbol Styles and Associated Terminology	25
168	3. Figure Showing Examples of the Zone of Confidence for Planar, Linear, and Point Features	29

169

170

171

172 TABLES

173		<i>Page</i>
174	1. Chart Showing Conversion Values from Inches (in) to Points (pts) to Millimeters (mm).....	A-iv
175	2. Abbreviations Used in This Standard.....	A-v
176	3. Spot Color Specifications Used in This Standard and Their Equivalent Colors in Other Color Models...	A-v

177	APPENDIX A. GEOLOGIC MAP SYMBOLS, COLORS, AND PATTERNS	
178		<i>Page</i>
179	Preface	A–ii
180	1. Contacts, Key Beds, and Dikes	A–1–1
181	1.1 Contacts	A–1–1
182	1.2 Key Beds	A–1–3
183	1.3 Dikes	A–1–5
184	1.4 Line-Symbol Decorations and Notations for Contacts, Key Beds, and Dikes	A–1–6
185	2. Faults	A–2–1
186	2.1 Faults (Generic; Vertical, Subvertical, or High-Angle; or Unknown or Unspecified	
187	Orientation or Sense of Slip)	A–2–1
188	2.2 Normal Faults	A–2–2
189	2.3 Low-Angle Faults (Unknown or Unspecified Sense of Slip)	A–2–3
190	2.4 Reverse Faults	A–2–3
191	2.5 Rotational or Scissor Faults	A–2–4
192	2.6 Strike-Slip Faults	A–2–5
193	2.7 Oblique-Slip Faults	A–2–6
194	2.8 Thrust Faults	A–2–7
195	2.9 Overturned Thrust Faults	A–2–8
196	2.10 Detachment Faults (Sense of Slip Unspecified)	A–2–9
197	2.11 Line-Symbol Decorations and Notations for Faults	A–2–11
198	2.12 Fault Scarps	A–2–12
199	2.13 Quaternary Faulting	A–2–16
200	2.14 Shear Zones; Mylonite Zones; Fault-Breccia Zones	A–2–16
201	2.15 Small, Minor Faults	A–2–16
202	3. Boundaries Located by Geophysical Surveys	A–3–1
203	3.1 Boundaries Located by Geophysical Methods	A–3–1
204	3.2 Faults Located by Geophysical Methods	A–3–1
205	3.3 Geophysical Survey Lines and Stations	A–3–1
206	4. Lineaments and Joints	A–4–1
207	4.1 Lineaments	A–4–1
208	4.2 Joints	A–4–1
209	4.3 Small, Minor Joints	A–4–1
210	5. Folds	A–5–1
211	5.1 Anticlines	A–5–1
212	5.2 Antiforms	A–5–2

213		<i>Page</i>
214	5.3 Asymmetric, Overturned, and Inverted Anticlines	A-5-3
215	5.4 Antiformal Sheath Folds	A-5-5
216	5.5 Synclines	A-5-6
217	5.6 Synforms	A-5-7
218	5.7 Asymmetric, Overturned, and Inverted Synclines	A-5-8
219	5.8 Synformal Sheath Folds	A-5-10
220	5.9 Monoclines	A-5-11
221	5.10 Line-Symbol Decorations And Notations For Folds	A-5-13
222	5.11 Small, Minor Folds	A-5-14
223	6. Bedding	A-6-1
224	7. Cleavage	A-7-1
225	8. Foliation	A-8-1
226	8.1 Generic Foliation (Origin Not Known or Not Specified)	A-8-1
227	8.2 Primary Foliation or Layering (in Igneous Rocks)	A-8-2
228	8.3 Secondary Foliation (Caused by Metamorphism Or Tectonism)	A-8-3
229	9. Lineation	A-9-1
230	10. Paleontological Features	A-10-1
231	10.1 Fossil Locality	A-10-1
232	10.2 Fossil Symbols	A-10-1
233	11. Geophysical and Structure Contours	A-11-1
234	12. Fluvial and Alluvial Features	A-12-1
235	13. Glacial and Glaciofluvial Features	A-13-1
236	14. Periglacial Features	A-14-1
237	15. Lacustrine and Marine Features	A-15-1
238	16. Eolian Features	A-16-1
239	17. Landslide and Mass-Wasting Features	A-17-1
240	18. Volcanic Features	A-18-1
241	19. Natural Resources	A-19-1
242	19.1 Veins and Mineralized Areas; Mineral Resource Areas; Metamorphic Facies Boundary	A-19-1
243	19.2 Areas of Extensively Disturbed Ground; Surface Workings; Subsurface Workings	
244	Projected to Surface	A-19-2
245	19.3 Mining and Mineral Exploration (at Surface)	A-19-3
246	19.4 Mines and Subsurface Workings	A-19-5
247	19.5 Oil and Gas Fields; Wells Drilled for Hydrocarbon Exploration or Exploitation	A-19-6
248	20. Hazardous Waste Sites	A-20-1

249		<i>Page</i>
250	21. Neotectonic and Earthquake-Hazard Features	A-21-1
251	22. Plate-Tectonic Features	A-22-1
252	23. Miscellaneous Uplift and Collapse Features	A-23-1
253	24. Terrestrial Impact Features	A-24-1
254	25. Planetary Geology Features	A-25-1
255	26. Geohydrologic Features	A-26-1
256	26.1 Water Wells	A-26-1
257	26.2 Springs	A-26-4
258	26.3 Water Gaging Stations	A-26-5
259	26.4 Quality-of-Water Sites	A-26-6
260	26.5 Geohydrologic Contours	A-26-7
261	26.6 Geohydrologic Lines	A-26-8
262	26.7 Miscellaneous Geohydrologic Features	A-26-9
263	27. Weather Stations	A-27-1
264	28. Transportation Features	A-28-1
265	29. Boundaries	A-29-1
266	30. Topographic And Hydrographic Features	A-30-1
267	30.1 Topographic, Bathymetric, And Glacier Contours	A-30-1
268	30.2 Drainage Features	A-30-4
269	30.3 Miscellaneous Topographic and Hydrographic Features	A-30-6
270	31. Miscellaneous Map Elements	A-31-1
271	32. Geologic Age Symbol Font ("FGDC-GeoAge")	A-32-1
272	33. Suggested Ranges of Map-Unit Colors for Volcanic and Plutonic Rocks and for Stratigraphic	
273	Ages of Sedimentary and Metamorphic Rocks	A-33-1
274	33.1 Suggested Range of Map-Unit Colors for Volcanic and Plutonic Rocks	A-33-1
275	33.2 Suggested Range of Map-Unit Colors for Stratigraphic Ages of Sedimentary and	
276	Metamorphic Rocks	A-33-1
277	34. State Location Maps	A-34-1
278	37.1 Individual States; District of Columbia; Guam; Puerto Rico; U.S. Virgin Islands	A-34-1
279	37.2 Conterminous States	A-34-3
280	35. Bar Scales	A-35-1
281	36. Mean Declination Arrows	A-36-1
282	36.1 Magnetic North, East of True North	A-36-1
283	36.2 Magnetic North, West of True North	A-36-3
284	37. Lithologic Patterns	A-36-1

285		<i>Page</i>
286	37.1 Sedimentary-Rock Lithologic Patterns	A-37-1
287	37.2 Metamorphic-Rock, Igneous-Rock, and Vein-Matter Lithologic Patterns	A-37-3
288	38. Explanation for Pattern Chart	A-38-1
289	39. Explanation for CMYK Color Chart	A-39-1
290		
291		
292		
293	INDEX	
294		
295	Index to Introductory Text and Appendix A	I-1
296		
297		
298		
299	PLATES	
300		
301	CMYK Color Chart	In pocket
302	Pattern Chart	In pocket
303		
304		
305		
306		

1. INTRODUCTORY MATERIAL

1.1 OBJECTIVE

This document provides a single national standard for the digital cartographic representation of geologic map features. This standard is intended to support the Nation's producers and users of geologic map information by providing line symbols, point symbols, and colors and patterns that can be used to portray the various features on geologic maps. The objective of this standard is to aid in the production of geologic maps and related products, as well as to help provide geologic maps and products that are more consistent in both their appearance and their underlying database content.

A geologic map is a cartographic product that expresses information about the geology of a particular area. The map uses graphical elements such as line symbols, point symbols, and colored or patterned areas to portray complex geological information such as the composition, age, genesis, and extent of an area's geologic materials, as well as the geometry, orientation, and character of the geologic structures that have deformed them. Geologic maps generally are intended for use by both the geoscience professional and the general public; however, designing and preparing a geologic map that will inform such a diverse audience can be a daunting task because of the complexity of both the mapping concepts and the geologic information. This standard attempts to facilitate map comprehension by providing clear and familiar symbology, thereby ensuring that the lines, points, and areas on the map convey the same meaning to all information producers and users. This standard also endeavors to clarify some of the concepts of geologic mapping, as well as to standardize some of the terminology used to describe the various features on a geologic map.

The imperative for the clear communication of geologic map information to such a diverse audience was outlined early in the history of the U.S. Geological Survey (USGS) by then-Director John Wesley Powell, who stated that "the maps are designed not so much for the specialist as for the people, who justly look to the official geologist for a classification, nomenclature, and system of convention so simple and expressive as to render his work immediately available alike to the theoretic physicist or astronomer, the practical engineer or miner, and the skilled agriculturist or artisan" (Powell, 1888, p. 229). The consistent, unambiguous expression of geologic map information is even more critical now because such information increasingly is compiled, stored, manipulated, and exchanged in digital files and geospatial databases. In the digital files, the cartographic representation of each feature on a geologic map must have a unique and explicit meaning, and it also must be compatible with the feature's attributes in the geologic map database. To that end, the preparers of this standard reviewed existing formal and informal USGS geologic map symbolization standards and adapted them for implementation with modern digital mapmaking systems and geospatial databases.

Although this standard is herein formalized, it is not intended to be used inflexibly or in a manner that will unduly restrict a geologist's ability to communicate the observations and interpretations gained from geologic mapping. On the contrary, this standard recognizes that, in certain situations, an existing symbol or its usage

might need to be modified to fit a particular geologic situation or setting. Likewise, this standard recognizes that a new symbol or set of symbols may need to be created to more fully express local geologic conditions or to keep pace with evolving geologic mapping concepts and practices. Accordingly, such new or modified symbols, if found to be of wide applicability, will be incorporated into this standard through planned, periodic revisions.

1.2 SCOPE

This standard contains descriptions, examples, cartographic specifications, and notes on usage for a wide variety of symbols that may be used on typical, general-purpose geologic maps and related products such as cross sections. However, the standard also can be used for different kinds of special-purpose or derivative map products and databases that may be focused on a specific geoscience topic (for example, slope stability) or class of features (for example, a fault map). The standard is scale-independent, meaning that the symbols are appropriate for use with geologic mapping compiled or published at any scale. It is designed for use by anyone who either produces or uses geologic map information, whether in analog or digital form.

1.3 APPLICABILITY

This document establishes standards that are applicable to all geologic map information (in other words, geologic maps and databases) published by the Federal Government and its Federally funded contractors and collaborators. Non-Federal agencies and private firms that produce geologic map information also are urged to adopt the standard.

The standard applies to all forms of geologic map publications, whether they are released as (1) hard-copy products, in either offset-print or plot-on-demand format, or (2) digital products, either as files for spatial analysis in Geographic Information Systems (GIS), as Portable Document Format (PDF) files in online publications, or as browse-graphic files for display on the World Wide Web. In particular, the standard applies to all geologic map products archived within the National Geologic Map Database (NGMDB), which is administered by the USGS: geologic map products submitted to and incorporated within the NGMDB will conform to this standard.

1.4 RELATED STANDARDS

The USGS traditionally has established nationally applicable cartographic standards for the production of geologic map information, both explicitly, through various formal and informal standards documents (see Section 2.1 below, entitled "Relation to Previous U.S. Geological Survey Standards"), and implicitly, through the cartographic content of its publications. This standard supersedes any existing USGS formal or informal cartographic standards for geologic maps.

During preparation of this standard, its relation to other standards or standards-development activities was assessed, and no significant conflicts were found. For example, the International Organization for Standardization (ISO) Standard 710, Parts 1–4, describes a general schema for graphical display of a selected

set of geologic map symbols. Although similar to some that are included in this standard, they were found to have limited applicability. In addition, similar standards have been developed in other agencies of the Federal Government, including the U.S. Forest Service (in the geology component of their Terra database), the U.S. Army Corps of Engineers (in the geology component of their Tri-Service CADD-GIS Spatial Data Standards), and the U.S. Bureau of Reclamation (in their Engineering Geology Office Manual). These were found to be somewhat specialized and limited in their coverage of geologic map features. Conversely, this standard provides comprehensive coverage of symbology for a broad range of geologic map features.

1.5 STANDARDS DEVELOPMENT PROCEDURES

This standards document represents only the latest milestone in a long history of geologic map standards development in the United States, which, within the USGS, began prior to 1881. As then-Director John Wesley Powell noted in 1888, in reference to geologic map standards under development at that time within the USGS, "While it is not professed that this [cartographic] system is final, or even unobjectionable, it represents the present state of knowledge and opinion" (Powell, 1888, p. 230). Although the present standards document draws heavily on previously established formal and informal cartographic standards of the USGS, it has undergone substantial revisions that reflect current geologic mapping practices and modern digital mapmaking methods. Accordingly, the standards-development procedures outlined in this section will address only the most recent development history of this standard (for a more complete historical background, see Section 2.1 below, entitled "Relation to Previous U.S. Geological Survey Standards").

This standards document was developed by members of the USGS Geologic Discipline's Western Publications Group and the National Geologic Map Database (NGMDB), with guidance and contributions from members of the Map Symbol Standards Committee (see below; see also, Section 2.3, entitled "Preparers of This Standard"). In addition, this standards document has benefited from the broad, modern-day perspective gained from the many thoughtful responses from reviewers of the Federal Geographic Data Committee's (FGDC) Public Review Draft of the standard (Federal Geographic Data Committee, 2000; see also, U.S. Geological Survey, 2000). The preparers of this standard gratefully acknowledge all current and prior participants and appreciate their invaluable contributions to the development of both this standards document and all preceding works.

In 1995, a proposed cartographic standard for geologic map information was informally released by the USGS as the "Cartographic and Digital Standard for Geologic Map Information" (U.S. Geological Survey, 1995a, 1995b). In 1996, this proposed standard was formally reviewed by geologists and cartographers from the USGS, as well as from the Association of American State Geologists (AASG), which represents the State geological surveys, and from the FGDC's Geologic Data Subcommittee, which is composed of representatives from Federal agencies that produce or use geologic map information. That review (Soller, 1996) indicated the need for some revision to the proposed standard prior to its consideration by the FGDC for formal adoption as a Federal standard.

In 1996, plans were outlined to create a revised and updated Federal standard, and an early standards-development group was formed (see Section 2.3 below, entitled "Preparers of This Standard"). A proposal to develop the revised standard was submitted by the FGDC's Geologic Data Subcommittee (see http://ncgmp.usgs.gov/fgdc_gds/mapsymbprop.html), and the FGDC accepted that proposal in 1997. Later that year, the standards-development group produced a preliminary version of the draft standard, which was circulated among selected USGS and State geological survey personnel for review. Comments were incorporated and, in 1999, the revised draft standard was submitted (as the "Working Draft") to the FGDC's Geologic Data Subcommittee for consideration. Upon review and subsequent approval by the Subcommittee, the Working Draft was submitted to the FGDC Standards Working Group, which, in 2000, approved the document for public review as the "Public Review Draft" (see below), pending adoption of minor changes.

The Public Review Draft of this standard was finalized and then published in April 2000 (Federal Geographic Data Committee, 2000; see also, U.S. Geological Survey, 2000). In May 2000, the public was invited to review the draft standard and to provide comments and suggestions for revision (see http://ncgmp.usgs.gov/fgdc_gds/mapsymb/mapsymbpubrev.html). At the end of the 120-day public review period (May 19 through September 15, 2000), all comments and suggestions to the Public Review Draft were compiled, and a plan was developed to address the comments and make the necessary changes. Under this plan, a standing Map Symbol Standards Committee was formed to assist in the resolution of the public's review comments and suggestions, as well as in the long-term maintenance of the standard. Committee members were drawn from the geologic mapping community in the State geological surveys, academia, and the USGS (see Section 2.3 below, entitled "Preparers of This Standard").

Revisions to the standards document began in 2001. The revised standard was approved by the Map Symbol Standards Committee, then by the FGDC Geologic Data Subcommittee, and then it was submitted to the FGDC Standards Working Group for formal approval in 2005.

This standard will be managed as a "living" standard—that is, it will be maintained and revised as needed to reflect new mapping concepts or evolving usage conventions. The initial release of this FGDC-approved standard is available as an offset-printed document, supplemented by electronic (CD-ROM) and online (PDF) versions. However, all future updates to this standard will be released online in PDF format only. To help maintain an up-to-date hard-copy version of the standards document, this initial offset-printed release has been designed in a "loose-leaf" format. Subsequent updates to this standards document may be downloaded as PDF files and then printed out and inserted where appropriate into a loose-leaf binder. These online updates will be the authoritative reference.

Because this standard is intended for use with digital applications, a PostScript implementation of the Public Review Draft was informally released as a USGS Open-File Report (U.S. Geological Survey, 2000). This early PostScript implementation enabled reviewers to directly apply the standard to geologic maps and illustrations prepared in desktop illustration and (or) publishing software. The PostScript implementation has been updated

to reflect changes found in the now-approved standard and has been released as a USGS Techniques and Methods report (U.S. Geological Survey, 2005). Additionally, preliminary work on an ArcGIS implementation may be completed in the future and released as a USGS report. Information regarding these implementation efforts will be posted on FGDC's Geologic Data Subcommittee website (http://ncgmp.usgs.gov/fgdc_gds/).

Questions and comments about, or suggested additions to, this standard may be submitted by e-mail to mapsymbol@flagmail.wr.usgs.gov or mailed to Geologic Map Symbol Standard, c/o David R. Soller, National Geologic Map Database, U.S. Geological Survey, 926A National Center, Reston, Virginia, 20192.

1.6 MAINTENANCE AUTHORITY

On behalf of the FGDC, the USGS will maintain this Federal standard. The responsibility for coordinating Federal geologic mapping information is stipulated by Office of Management and Budget Circular A-16 (see <http://www.whitehouse.gov/omb/circulars/a016/a016.html>). The Geologic Mapping Act of 1992 (see <http://ncgmp.usgs.gov/info/ngmact.html> and subsequent reauthorizations) stipulates a requirement for standards development under the auspices of the National Geologic Map Database (NGMDB). Under this authority, the NGMDB will function on behalf of the USGS as coordinator of this maintenance activity (see <http://ngmdb.usgs.gov/info/standards/general.html>). Maintenance will be conducted in cooperation primarily with the AASG, which is the USGS's partner in the Geologic Mapping Act. The NGMDB will continue to rely on the Map Symbol Standards Committee to assist in its maintenance efforts. The Committee membership comes from the NGMDB, the USGS scientific staff and Publications Groups, the AASG, and the academic community (see Section 2.3 below, entitled "Preparers of This Standard"). The Committee will, as needed, review comments and suggestions for revisions, additions, and deletions to the standard.

2. BACKGROUND

2.1 RELATION TO PREVIOUS U.S. GEOLOGICAL SURVEY STANDARDS

Soon after the USGS was established in 1879, USGS geologists began to map and assess the Nation's lands, including many areas previously unexplored by Europeans. A new publication series, the Geologic Atlas (or "Folio") series, was created to publish many of these maps. Beginning prior to 1881, the USGS, then under the direction of John Wesley Powell, began to identify geologic and cartographic standards and conventions necessary to uniformly portray the geology in this series: "In providing for the publication of this large body of material, it seemed wise to adopt a common system of general nomenclature, a uniform color scheme for geographic geology, a system of conventional characters for diagrams, and a form for geologic and topographic charts and atlases" (Powell, 1882a, p. XL; see also, Powell, 1882b, for an elaboration on the proposed standards). Following a 1889 Conference on Map Publication, these standards were articulated in more detail and then were published (Powell, 1890).

The standards that were adopted by the USGS in the 1880s served as a strong foundation for the Nation's

geological science. Paramount to systematized geologic mapping was the adoption of a standard rock stratigraphic nomenclature, a naming convention for geologic formations, and the subdivisions of geologic time. Another significant contribution was the adoption of a standardized color scheme for displaying geologic map units. This scheme used pure, single-ink colors, usually a different one for each geologic time period; to achieve this, a practical and informative system of overprint patterns also was developed, which served to differentiate the various mapped units within a single time period. Although this single-ink color scheme did not persist intact in the twentieth century because of the emergence of more modern printing technologies (for example, the combining of CMYK—cyan, magenta, yellow, and black—inks to produce a greater variety of colors), many of the overprint patterns that were developed then are still in use today.

In the following decades, as the geological sciences advanced, the concepts of geologic processes and historical geology became more complex, and new insights and refinements required more map symbols and precise scientific cartographic methods to convey details of geology. In 1920, the USGS published a manual on the preparation of illustrations (Ridgway, 1920). By that time, the need for standardization had become urgent: "More than 200 symbols have been used on maps to express 25 different kinds of data, a fact indicating at once a notable lack of uniformity and a need of standardization" (Ridgway, 1920, p. 20). The manual addressed various issues associated with geologic cartography, including standard symbology for geologic maps and cross sections (for example, geologic line and point symbols, water wells, oil and gas wells, coal seams, mine workings, and topographic and other base-category information) and stratigraphic columns (for example, lithologic patterns).

After 1920, and throughout much of the twentieth century, the maintenance of USGS standards for geologic map symbolization and cartography was an internal and somewhat informal process enacted through official USGS policy. For example, USGS Chief Geologist W.H. Bradley (written commun., 1956) adopted recommendations and a list of symbols from the Map Symbol Committee (E.N. Goddard, Chairman), and USGS Chief Geologist D.L. Peck (written commun., 1978) adopted recommendations from the committee for Standards for General Purpose Geologic Maps (J.C. Reed, Chairman).

In the mid-1970s, the USGS outlined the technical specifications for geologic symbology in its informal "Technical Cartographic Standards" volume (U.S. Geological Survey, ca. 1975). This informal standard, which was maintained until the mid-1980s, was available to USGS cartographers and editors as a set of green, loose-leaf notebooks that allowed pages to be replaced as the standard evolved. The technical specifications at that time were devised to serve the needs of cartographers who prepared maps for offset-print publication using hand-placed type, hand-scribed linework, and peelcoat color-separation techniques. This informal standard served the USGS well, but it was not available to other producers or users of geologic maps, nor was it formally recognized as a standard by the Nation's geoscience community. However, the cartographic details of this standard were clearly displayed on USGS geologic maps. And so, drawing from the cartographic content of USGS maps, others have published manuals on geologic map standards that have (unofficially) incorporated

parts of this informal standard: for example, the American Geological Institute's "AGI Data Sheets for Geology in the Field, Laboratory, and Office" (Dietrich and others, 1982 [2nd ed.]; Dutro and others, 1989 [3rd ed.]) includes many symbols commonly shown on USGS geologic maps (see also, "Suggestions to Authors of the Reports of the United States Geological Survey" [7th ed.]; Hansen, 1991).

Beginning about the mid-1980s, digital-cartographic and GIS (Geographic Information System) technologies rapidly evolved and became more widely available. The gradual adoption of digitally based mapmaking methods made clear the need to develop new cartographic standards that would satisfy the requirements of the latest technologies for the preparation of digital files, whether they are to be used for geospatial databases, for plot-on-demand or online map publications, or for the production of negatives for offset printing of maps.

In response to this steady increase in digital mapmaking and the accompanying concern about preparing consistent, high-quality, digitally produced geologic maps and geologic map databases, the USGS informally released in 1995 a proposed standard entitled "Cartographic and Digital Standard for Geologic Map Information" (U.S. Geological Survey, 1995a). As noted above, subsequent review of that document by the USGS, the AASG, and the FGDC's Geologic Data Subcommittee (Soller, 1996) indicated the need for some revision prior to its consideration by the FGDC for formal adoption as a Federal standard, which led to the development of this standard (see discussion in Section 1.5 above, entitled "Standards Development Procedures").

2.2 CHANGES FROM PREVIOUS STANDARDS

In this new standard (contained in [normative] appendix A), descriptions, examples, cartographic specifications, and notes on usage are provided for a wide variety of symbols that may be used on typical digital geologic maps or related products such as cross sections. In the preparation of this standard, every effort was made to retain the original symbols and their specifications from the 1995 USGS proposed standard (U.S. Geological Survey, 1995a); however, many updates have been incorporated into this new version. The number of symbols has increased significantly, from about 800 to over 2300. Symbols are more logically grouped; some sections have been combined with others, and a few new sections have been added.

Many symbols, particularly lines, have been redesigned slightly so that they would more successfully translate to digital applications. For instance, in the old "Technical Cartographic Standards" volume (U.S. Geological Survey, ca. 1975), as well as in the 1995 USGS proposed standard (U.S. Geological Survey, 1995a), the lineweight for contacts was specified as .005 inches (.125 millimeters). However, experience has shown that .005-inch lines do not always plot well when digitally output by high-resolution imagesetters. Therefore, the minimum lineweight for contacts, as well as for most other stroked-line symbol elements, has been increased to .006 inches (.15 millimeters) in this new standard. In addition, the dash and gap lengths for many line symbols have been adjusted so that their dash-gap templates can be more easily defined electronically.

A chart showing a wide range of CMYK colors ("CMYK Color Chart") has been included; an offset-print

version of this chart has been in use at the USGS for many years, and the variety of colors has proved to be sufficient for portraying complex geology shown on most maps, regardless of the output medium. In addition, a chart that shows commonly used geologic patterns ("Pattern Chart") has been added; the patterns themselves are similar to what was in the old "Technical Cartographic Standards" volume (U.S. Geological Survey, ca. 1975), as well as in the 1995 USGS proposed standard (U.S. Geological Survey, 1995a), but most have undergone linewidth changes to facilitate digital output at high resolutions. The old pattern numbers have been revised and the patterns are now organized into seven geologically relevant series. A few new patterns have been added, and some have been eliminated. In addition, each pattern in the Pattern Chart, as well as each color in the CMYK Color Chart, has associated with it a generic lookup-table number that, if desired, may be used to access the pattern (or color) from within digital applications.

Also included in this new standard is a diagram showing suggested ranges of map-unit colors for stratigraphic ages of sedimentary and metamorphic rocks, as well as for volcanic and plutonic rocks. In addition, a new geologic age symbol font ("FGDC-GeoAge") has been added. Three new sections that address map marginalia have been included: (1) quadrangle location maps for each of the 50 states (and District of Columbia, Guam, Puerto Rico, and U.S. Virgin Islands), as well as a map of the 48 conterminous states (so that quadrangle locations covering more than one state can be shown); (2) a variety of bar scales, as well as calculation tables that show how to convert between inches, miles, and kilometers; and (3) a series of mean declination arrows, showing magnetic north both east and west of true north.

A few new informational sections have been added to the introductory material in this standard. The section entitled "Guidelines for Map Color and Pattern Selection" provides useful information on color selection and the use of patterns. The section entitled "Guidelines for Map Labeling" provides recommendations on placement of text on a map.

The most significant update to this standard is the addition of two important sections to the introductory material. The section entitled "Geologic Mapping Concepts and Definitions" provides basic information about some of the fundamental concepts of geologic mapping, as well as defines and categorizes the various types of geologic map features. The section entitled "Scientific Confidence and Locational Accuracy of Geologic Features" clarifies the concepts of, and establishes new terminology for, the levels of scientific confidence and locational accuracy of geologic map features.

In response to reviewer's comments (Soller, 1996), much of the first part of the 1995 USGS proposed standard has been abandoned because it was either not pertinent to this standard (for example, the sections on geologic map content, metadata, and geocoding) or not widely applicable to the full range of mapping situations (for example, the specification of a "1.0 mm accuracy standard"). In addition, no attempt has been made in this new standard to provide detailed definitions for the geologic features represented by the various symbols. For such information, please refer to one of a number of reference books available; an excellent source is the American Geological Institute's Glossary of Geology (Bates and Jackson, 1987 [3rd ed.]; Jackson, 1997 [4th ed.]).

2.3 PREPARERS OF THIS STANDARD

Principal contributors¹ to the preparation of this FGDC Digital Cartographic Standard for Geologic Map Symbolization include the following individuals:

David R. Soller (USGS; Chief, National Geologic Map Database)—Coordinator, author, and editor, FGDC Digital Cartographic Standard for Geologic Map Symbolization; coordinator, Map Symbol Standards Committee.

Taryn A. Lindquist (USGS; Digital Map Specialist and Geologic Map Editor, Western Publications Group)—Editor, author, and compiler, FGDC Digital Cartographic Standard for Geologic Map Symbolization; designer, line symbols and point symbols, FGDC Digital Cartographic Standard for Geologic Map Symbolization.

Map Symbol Standards Committee: Thomas Berg (State Geologist, Ohio); Jay Parrish (State Geologist, Pennsylvania); Mark Jirsa (Minnesota Geological Survey); Robert Hatcher (University of Tennessee, Knoxville); Steven Reynolds (Arizona State University); and Byron Stone, Jack Reed, Jonathan Matti, Taryn Lindquist, and David Soller (all USGS)—Referees and reviewers of public comments and subsequent revisions, Public Review Draft (Jonathan Matti is especially noted for his guidance on issues of scientific confidence and locational accuracy).

Sara Boore (USGS; Publication Graphics Specialist, Western Publications Group)—Book designer, FGDC Digital Cartographic Standard for Geologic Map Symbolization; designer, point symbols, line symbols, color charts, and patterns, FGDC Digital Cartographic Standard for Geologic Map Symbolization.

F. Craig Brunstein (USGS; Geologic Map Editor, Central Publications Group)—Technical reviewer, Working Draft.

Alessandro J. Donatich (USGS; Geologic Map Editor, Central Publications Group)—Technical reviewer, Working Draft.

Carolyn Donlin (USGS; Online Publications Specialist and Geologic Map Editor, Western Publications Group)—Preparer, online publication of Public Review Draft (PostScript implementation).

Michael F. Diggles (USGS; CD-ROM Publications Specialist and Online Publications Specialist, Western Publications Group)—Preparer, CD-ROM publications of PostScript implementations; preparer, online publication of FGDC-approved standard (PostScript implementation).

Kevin Ghequiere (USGS; Cartographer, Western Publications Group)—Designer, patterns, FGDC Digital

¹ Unless otherwise noted, persons listed as contributors to the "FGDC Digital Cartographic Standard for Geologic Map Symbolization" participated in the preparation of the following versions of the standard: the Working Draft; the Public Review Draft (Federal Geographic Data Committee, 2000) and its PostScript implementation (U.S. Geological Survey, 2000); and the now FGDC-approved standard (this document) and its PostScript implementation (U.S. Geological Survey, 2005).

Cartographic Standard for Geologic Map Symbolization.

Richard D. Koch (USGS; Digital Map Specialist, Western Publications Group)—Designer, geologic age symbol font, FGDC Digital Cartographic Standard for Geologic Map Symbolization.

Diane E. Lane (USGS; Geologic Map Editor, Central Publications Group)—Technical reviewer, Working Draft.

Susan E. Mayfield (USGS; Publication Graphics Specialist, Western Publications Group)—Designer, color charts and patterns, FGDC Digital Cartographic Standard for Geologic Map Symbolization.

Kathryn Nimz (USGS; Digital Map Specialist, Western Publications Group)—Designer, patterns, FGDC Digital Cartographic Standard for Geologic Map Symbolization.

Glenn Schumacher (USGS; Publication Graphics Specialist, Western Publications Group)—Designer, bar scales, mean declination arrows, and quadrangle location maps, FGDC Digital Cartographic Standard for Geologic Map Symbolization.

Stephen L. Scott (USGS; Publication Graphics Specialist, Western Publications Group)—Designer, point symbols and line symbols, FGDC Digital Cartographic Standard for Geologic Map Symbolization.

Will Stettner (USGS; Cartographer, Eastern Publications Group)—Technical reviewer, Working Draft.

José F. Vigil (USGS; Motion Graphics Specialist, Western Publications Group)—Designer, geologic age symbol font, FGDC Digital Cartographic Standard for Geologic Map Symbolization.

Jan L. Zigler (USGS; Geologic Map Editor, Western Publications Group)—Technical reviewer, Working Draft.

3. GEOLOGIC MAPPING CONCEPTS AND DEFINITIONS

3.1 GEOLOGIC MAPS

A *geologic map* is a cartographic product that portrays information about the geologic character of a specific geographic area. It is a two-dimensional representation of real-world, three-dimensional geologic features. To achieve this, a geologic map uses graphical elements to express detailed information about the different kinds of earth materials, the boundaries that separate them, and the geologic structures that have subsequently deformed them. For example, a typical general-purpose geologic map may consist of *lines* that trace contacts, faults, and folds; *points* that locate bedding attitudes, minor fold orientations, and sample localities; *areas* that represent geologic units, landslides, and areas of alteration; and *labels* that identify geologic map units, sample-locality numbers, and fault names. Thus, an appropriately symbolized and labeled geologic map can portray comprehensive information about the composition, age, and genesis of the geologic materials and the nature of their boundaries, as well as the character and three-dimensional geometry of the geologic structures that have deformed them. In addition, such geologic map information usually is drawn onto a base map that also uses

graphical elements to represent the topography, drainage, and cultural features of an area, and so a geologic map also can depict the spatial relation of the various geologic features to the physical landscape. Other things that may be shown on a geologic map include information about the geomorphology, pedology, paleontology, rock alteration and mineralization, geophysics, geochemistry, or geochronology of an area.

3.2 GEOLOGIC MAP DATABASES

A *geologic map database* is a digitally compiled collection of spatial (geographically referenced) and descriptive geologic information about a specific geographic area. The information in the geologic map database consists of (1) the geographic location and the orientation, length, shape, and (or) area (in other words, the geometry) of each geologic feature or object (for example, an outcrop or a fault), and (2) many different types of descriptive geologic information about each feature or object.

A geologic map database also may contain extensive amounts of additional qualitative and quantitative geologic information. For example, a geologic map database may include geochemical analyses, radiometric ages, soil-horizon information, and geophysical contours, as well as information on the weathering of surface exposures of geologic features, the subsurface geometry of geologic map units, and the glacial landforms or other types of geomorphic features.

Fundamental data elements of a geologic map database are *lines* (for example, contacts and faults), *points* (for example, bedding attitudes and fossil localities), and *areas* or *polygons* (for example, map-unit areas and zones of alteration). In addition, each feature or object in the geologic map database has several associated *feature attributes*. The most basic feature attributes may simply identify the feature (for example, "thrust fault" or "overturned anticline") and express its scientific confidence and locational accuracy (for example, "identity certain" or "location inferred"). Other feature attributes may consist of detailed descriptions of each feature (for example, the lithologic characteristics of a map unit, the dip of a mapped fault, or the identification and age determination of a fossil specimen).

When a geologic map is generated as a cartographic product from a geologic map database, each geologic feature is represented by a specific *geologic map symbol*. The attributes in the database provide the information needed to symbolize each feature. In addition, *annotation* is added to the geologic map wherever necessary to identify the various features (for example, map-unit labels and fault names) and to provide essential quantitative information (for example, dip values and fossil-locality numbers).

3.3 GEOLOGIC MAP UNITS

A *geologic map unit* is a cartographic representation of a volume of geologic materials that share enough characteristics (for example, the composition, areal extent, age, and (or) genesis) to be considered a single entity (a single geologic unit). On a typical geologic map, most geologic units are represented by polygons that are filled with colors and (or) patterns. Geologic units can also be represented by lines (for example, dikes) or points (for example, blueschist blocks).

The *formation*, whether formal or informal, is the lithostratigraphic unit most commonly depicted on a geologic map. A formation can be subdivided into lower rank stratigraphic units (for example, members, tongues, lentils, or beds) or assembled with other formations to make up more generalized, higher rank stratigraphic units (for example, groups or supergroups), depending on the scale of the map or the focus of the geologist (see guidelines for the recognition and naming of geologic units by the North American Commission on Stratigraphic Nomenclature, 1983).

3.3.1 Geologic Time, the Ages of Rock Units, and Geologic Age Symbols

The USGS has published a scheme for the major divisions of *geologic time*, the age estimates of the boundaries, and the specialized *geologic age symbols* to be used on geologic maps (Hansen, 1991). This particular scheme was formally adopted after a 1980 meeting of the Geologic Names Committee of the USGS (Hansen, 1991). In addition, several other schemes of geologic time boundaries have been published (see, for example, Berggren and others, 1995; Gradstein and Ogg, 1996; Haq and van Eysinga, 1998; Harland and others, 1982, 1989; International Union of Geological Sciences, 1998; Palmer, 1983; Palmer and Geissman, 1999; Snelling, 1985), each of which is based on different assumptions, techniques, and (or) data. Any formally published age scheme may be used for a particular map, as long as which scheme was used is specified on the map and in the geologic map database.

3.3.2 Map-Unit Labels

A *map-unit label* is an alphanumeric symbol that identifies the geologic map unit on the map. The map-unit symbol is an abbreviated acronym that usually is made up of, in the following order, (1) either capital letters or geologic age symbols indicating the age of the geologic unit (see Appendix A, Section 32), and (2) lower case letters denoting the name or the lithologic characteristics of the geologic unit. In some cases, numerical subscripts are added to designate different subunits (for example, members or individual lava flows) within a geologic unit.

Map-unit labels are added to the geologic map wherever necessary to clearly identify the various geologic map units. In addition, map-unit labels are included among the feature attributes in the geologic map database, thereby designating each mapped area as belonging to a particular geologic map unit.

3.4 PLANAR GEOLOGIC FEATURES

A *planar geologic feature* is a two-dimensional geologic surface, which may be either a real-world, physical surface (for example, a contact between two geologic units) or a hypothetical surface (for example, an axial surface of a fold). The geometry of the geologic surface may be flat, curved, or crenulated, and its orientation may be horizontal, inclined, vertical, or overturned.

The intersection of a planar geologic feature with the ground surface forms a real or perceived (projected) linear trace. When these linear traces are mapped in the field and then plotted as lines on a base map, they become the

most basic and fundamental elements of a typical geologic map: they may delineate simple map-unit areas, or they may define complex patterns of structural deformation. The various types of linear traces are portrayed on a geologic map by unique line symbols (Appendix A), each of which has a different width, pattern, ornamentation, or color; thus, a particular line symbol conveys specific information about the character and (or) geometry of each planar geologic feature.

3.4.1 Contacts

A *contact* is a planar surface that bounds a geologic unit (except where that bounding surface is a fault; see discussion below in Section 3.4.3, entitled "Faults"). A contact is intrinsic to the genesis of each geologic unit; that is, the contact delineates the stratigraphic position where, owing to changing environmental conditions or other genetic factors at the time of origin, the properties and characteristics of one geologic unit change, either abruptly or gradually, to those of another geologic unit.

Discussion of contacts in this standard primarily pertains to those that have been mapped in the field (for example, contacts that bound formations, members, beds, lava flows, or intrusions). Contacts can also exist between higher rank units, although these contacts typically are not mapped in the field; instead, they are concepts that may arise later when lower rank stratigraphic units are combined into higher rank stratigraphic units (see discussion of lithostratigraphic boundaries by the North American Commission on Stratigraphic Nomenclature, 1983, p. 856–58).

Contacts can be classified as one of a number of types, depending on the nature or origin of the contact and the geologic units that it separates. Examples of such contact types include the following: sedimentary (conformable; unconformable, etc.); alluvial; landslide; residual; igneous (intrusive, extrusive, pyroclastic); metamorphic; and high-strain (cataclastic, mylonitic, tectonic). If available, supplemental information about a contact's type is added as a feature attribute to the geologic map database; however, specialized line symbols usually are not used to represent these various contact types. In general, unless otherwise stated on the geologic map or in the geologic map database, contacts should be considered generic; that is, they have no particular type or identity.

The geologic age of a contact also may be specified as a feature attribute in the geologic map database, but rarely is this characteristic symbolized on the geologic map; if desired, such information can be communicated by the addition of geologic point data or annotation placed along the trace of the contact. In addition, specific information collected about a contact's local surface exposure, orientation or character can be added as geologic point data and annotation placed along the trace of the contact where the observation was made.

3.4.1.1 Discrete versus Gradational Contacts

In the field, a contact between two geologic units is a transition zone whose width can range from very narrow to very broad. Examples of transition zones include the following:

- a single surface, as sharply delineated as a knife-edge, between two lithologically distinct geologic units;
- a single surface that zigzags between two intertonguing geologic units;
- a narrow zone, a few centimeters to a few decimeters wide, in which the lithologic character changes from one geologic unit to another;
- a diffuse zone, a few meters to many meters wide, in which the lithologic character of one geologic unit gives way gradually to that of another geologic unit.

Despite the differences inherent in each of these examples, contacts generally can be classified as either one of two types of transition zones: *discrete* or *gradational*. A precise definition of the width of a discrete versus a gradational contact, however, is difficult because of (1) different scales of mapping (for example, a contact that is gradational at a scale of 1:24,000 would probably be considered discrete at a scale of 1:100,000); (2) differing interpretations that can arise between geologists whose mapping primarily focuses on either sedimentary, igneous, or metamorphic rocks (for example, contact relations that are considered gradational by a geologist who maps sedimentary rocks may be viewed as discrete by a geologist who maps plutonic rocks); and (3) differences in individual biases that may arise from different geologic-mapping traditions in geologically dissimilar parts of the Nation. Because of these and other factors, this standard makes no attempt to delimit the precise width of a discrete or a gradational contact. Nevertheless, this standard provides the following general definitions:

A *discrete* contact is a map-unit boundary that is individually distinct; that is, the transition between geologic units is abrupt enough to be recognized and delineated easily on the map. A discrete contact may be a sharp, knife-edged surface, or it may be transitional across a zone as wide as a meter or more, depending on the scale of the map.

A *gradational* contact is a map-unit boundary that is diffuse; that is, the transition between geologic units is gradual enough that it cannot be recognized or delineated easily on the map. A gradational contact is so diffuse across the transition zone (the width of which will vary at different map scales) that delineation of its exact position can be difficult.

The discrete versus gradational character of a contact is specified as a feature attribute in the geologic map database. In addition, if the map scale allows, gradational contacts can be represented on the geologic map by a specialized line symbol (see Appendix A, Section 1). Unless otherwise stated on the map or in the geologic map database, however, a generic contact (that is, one not represented by a specialized line symbol) should be considered discrete at the scale of the map.

3.4.2 Key Beds

A *key bed* is an easily identifiable stratigraphic marker bed within a geologic unit. Although a key bed is a three-dimensional volume rather than a two-dimensional surface, commonly it is too thin to depict as a map-

unit area at most map scales, and so it usually is classified as a planar geologic feature.

Key beds are identified on the basis of their lithologic character and, in most cases, their relation to the surrounding rock materials. Examples of various types of key beds include the following:

- a coal bed;
- a fossiliferous horizon;
- a cross-cutting dike;
- a clay bed in a dominantly coarse-grained sedimentary sequence;
- a gravel bed in a dominantly fine-grained sedimentary sequence;
- a marine sedimentary bed in a dominantly nonmarine sedimentary sequence;
- a nonmarine sedimentary bed in a dominantly marine sedimentary sequence;
- a sandstone bed in a dominantly carbonate sedimentary sequence;
- a limestone bed in a dominantly dolomitic sedimentary sequence;
- a volcanic-ash bed or flow in a dominantly nonvolcanic sequence.

The type of key bed can be specified as a feature attribute in the geologic map database. In addition, some types of key beds are portrayed on the geologic map by specialized line symbols (see Appendix A, Section 1). In some cases, if the map scale allows, key beds are represented by colored or patterned areas. Map-unit labels are added to the geologic map to identify the various types of key beds shown on the map. In addition, map-unit labels are included among the feature attributes in the geologic map database to identify each key bed.

3.4.3 Faults

A *fault* is a planar surface of rupture along which geologic units have been fractured and then displaced. Faults can be geometrically complex structures that juxtapose map units over great distances, or they can be simple fracture planes along which the amount of offset is very small.

Discussion of faults in this standard primarily pertains to those that have been mapped in the field. Faults also can be required conceptually when lower rank stratigraphic units are grouped into higher rank units or tectonostratigraphic terranes, although these faults may not have been observed in the field.

Faults can be classified as one of a number of types, depending on the nature of their geometry and (or) sense of offset. Examples of fault types include the following: normal (low-angle, listric); reverse; thrust; overturned thrust; vertical; strike-slip (right-lateral, left-lateral); oblique-slip; detachment; or some combination of the above. Information about a fault's type is specified as a feature attribute in the geologic map database. When the map scale allows, such information also is represented on the geologic map by a specialized line symbol and (or) line-symbol decoration. A particularly robust set of specialized line symbols and line-symbol decorations

has evolved to represent the various fault types (see Appendix A, Section 2). In general, unless otherwise stated on the map or in the geologic map database, faults that lack such specialized symbology should be considered generic; that is, their geometry or sense of offset either is not known or has not been specified.

The age of a fault also can be specified as a feature attribute in the geologic map database, but rarely is this characteristic symbolized on the geologic map; if desired, such information can be communicated through the addition of geologic point data or annotation placed along the trace of the fault. In addition, specific information collected about a fault's local orientation can be added as geologic point data and annotation placed along the trace of the fault where the observation was made.

Some faults are relatively minor structures whose traces are mapped within single geologic units until the faults can no longer be observed or they no longer exist. More commonly, faults are mapped as larger, thoroughgoing structures that can produce a significant amount of offset between one or more geologic units, so that the rupture surfaces form new map-unit boundaries. In addition, faulting sometimes can take place at the stratigraphic position where a contact would normally exist between two stratigraphically coherent geologic units. But because faulting is not a process intrinsic to a geologic units' genesis (in these cases, faulting has occurred through already-formed geologic units), these bounding surfaces do not meet the criteria to be called contacts (see discussion above in Section 3.4.1, entitled "Contacts"). Therefore, although they may form boundaries between geologic units, such structures are classified as "faults," not "fault contacts" or "faulted contacts."

3.4.3.1 Discrete Faults versus Fault Zones

In the field, a fault forms a zone of offset whose width can range from very narrow to very broad. Examples of such zones of offset include the following:

- a single offset-fracture surface, as sharply delineated as a knife-edge;
- a narrow zone of offset, a few centimeters to a few decimeters wide;
- a diffuse zone, a few meters to many meters or as much as a kilometer or more wide, within which offset has been distributed among a few or many shear planes.

Despite the differences inherent in each of these examples, faults generally can be described in either one of two ways: as a *discrete fault* or as a *fault zone*. A precise definition of the width of a discrete fault versus a fault zone, however, is difficult for a number of reasons (see related discussion above in Section 3.4.1.1, entitled "Discrete versus Gradational Contacts"), and this standard makes no attempt to do so. Nevertheless, this standard provides the following general definitions:

A *discrete fault* is a zone of offset that is individually distinct; that is, the zone is narrow enough to be recognized and delineated easily on the map. A discrete fault may be a sharp, knife-edged surface of offset, or it may be a zone of offset as wide as a meter or more, depending on the scale of the map.

A *fault zone* (also called a *shear zone*) is a diffuse zone within which offset has been distributed among a few or many shear planes, commonly resulting in a zone of crushed and sheared or ductily deformed rock. In some cases, a fault zone can be mapped as an area bounded by discrete fault planes.

The character of a fault (discrete fault versus fault zone) is specified as a feature attribute in the geologic map database. In addition, a fault zone can be portrayed either by a specialized line symbol or, if the map scale allows, by a colored or patterned area (see Appendix A, Section 2). Unless otherwise stated on the map or in the geologic map database, a generic fault (that is, one not portrayed as an area or by a specialized line symbol) should be considered discrete at the scale of the map.

3.4.4 Folds

In its simplest sense, a *fold* is a geologic structure that results when a flat-lying or otherwise undeformed geologic surface is warped and deformed into an undulating geologic surface. In reality, many fold structures further deform bodies of rock that may already be highly deformed and (or) metamorphosed. Thus, folds may form simple, symmetric structures, or they may form complex, multidimensional and multigenerational fold systems.

The *fold axis* or *hinge line* of a fold is a hypothetical line that traces the locus of maximum curvature of the fold structure. The *axial surface* or *axial plane* of a fold is a hypothetical planar surface that connects the fold axes or hinge lines of folded strata.

Folds can be classified as one of a number of fold types, depending on the geometry of the fold's axial surface and the geometry and the relative ages of the folded strata. Examples of fold types include the following: anticline, syncline, monocline; antiform, synform; symmetrical, asymmetrical, overturned, inverted, isoclinal, recumbent, and plunging.

Information about a fold's type is specified as a feature attribute in the geologic map database. In addition, such information is portrayed on the geologic map by specialized line symbols and line-symbol decorations (see Appendix A, Section 5). On a geologic map, a fold is mapped as a line where the trace of its axial surface intersects the ground surface. In some cases, the trace of a fold's *crest line* (highest point on a fold's crest) or *trough line* (lowest point in a fold's trough) can also be mapped.

The age of a fold also can be specified as a feature attribute in the geologic map database, but rarely is this characteristic symbolized on the geologic map; if desired, such information can be communicated through the addition of geologic point data or annotation placed along the trace of the fold. In addition, specific data collected about a fold's local orientation can be added as geologic point data and annotation placed along the trace of the fold where the observation was made.

3.5 LINEAR GEOLOGIC FEATURES

A *linear geologic feature* is a one-dimensional geologic or geomorphic line, which may be either a real-world,

physical line (for example, a fault-scarp lineament or an outcrop-scale lineation) or a hypothetical line (for example, a hinge line of a fold or a paleocurrent direction). The geometry of the line may be straight, curved, or crenulated, and its orientation may be horizontal, inclined, or vertical.

The orientations of linear geologic features are mapped in the field and then plotted as lines on a base map. Information about the various types of linear geologic features is specified as a feature attribute in the geologic map database. In addition, such information is represented on a geologic map by a unique line symbol (Appendix A), each of which has a different width, pattern, ornamentation, or color; thus, a particular line symbol conveys specific information about the character and (or) geometry of each linear geologic feature.

3.6 GEOLOGIC POINT FEATURES

A *geologic point feature* consists of geologic or geomorphic information that has been collected at a particular point of observation in the field (except when that point feature is a line-symbol decoration; see discussion below in Section 3.6.3.2, entitled "Line-Symbol Decorations"). In some field situations, more than one observation can be taken at a single locality.

Geologic point data may pertain to a planar feature (for example, the orientation of bedded strata), a linear feature (for example, the plunge of a fold axis), or a single locality (for example, a fossil locality). Geologic point data also can be added as line-symbol decorations (for example, anticline arrows) that provide supplemental information about a particular part of a line on a geologic map.

Geologic point data are recorded in the field and then plotted as points on a base map. Information about the various types of geologic point data is specified as a feature attribute in the geologic map database. In addition, such information usually is represented on a geologic map by specialized point symbols and associated annotation (Appendix A).

3.6.1 Planar-Feature Geologic Point Data

Planar-feature geologic point data consist of quantitative information about the character and the orientation of a geologic surface, which may be a physical surface (for example, a fault plane or bedded strata) or a hypothetical surface (for example, an axial surface of a fold or a plane of foliation). The geologic surface may be horizontal, inclined, vertical, or overturned.

Two measurements, the *strike* and the *dip*, define the orientation of a geologic surface in three-dimensional space:

- the *strike* of a surface is the azimuthal direction of a hypothetical line formed by the intersection of the surface with an imaginary horizontal surface, as measured in the direction that the observer is facing when the surface dips down to the right (this method of directional measurement follows the *right-hand rule* convention);
- the *dip* of a surface is the angle of departure of that surface downward from horizontal, as measured

perpendicular to the line of strike.

Information about the type of observation, as well as the values of strike and dip, is specified as feature attributes in the geologic map database. Such information also is represented on the geologic map by specialized point symbols and associated annotation: the strike value and the direction of dip are implicit in the orientation of the point symbol; the dip value is added as annotation.

3.6.1.1 Point Symbols for Planar Features, and Their Placement Relative to Point of Observation

The point symbols for inclined or overturned planar features typically are made up of two parts: a long shaft oriented in the strike direction, and a short tick (or ornamentation such as a triangle) pointing in the downdip direction. The point symbol is placed on the map so that the intersection of its long shaft and short tick (or ornamentation) is at the point of observation. When data have been collected about the local orientation of a planar feature that has been represented on the map by a line symbol (for example, the dip of a contact or a fault), the point symbol is placed directly on the line symbol at the point of observation.

The point symbols for vertical planar features are similar to those for inclined surfaces, except that two short ticks (or ornamentations), not one, point away from the long shaft. The point symbol is placed on the map so that the intersection of its long shaft and short ticks (or ornamentations) is at the point of observation.

The point symbols for horizontal planar features, which display no directional information, are simply placed on the map at the point of observation.

3.6.1.2 Specialized Planar-Feature Point Symbols for Multiple Observations at One Locality

In situations where more than one observation has been taken at a single locality, point symbols for planar features can be combined with other point symbols at the point of observation. In these cases, specialized point symbols may be used to avoid the overprinting of information. These specialized point symbols have the short ticks (or ornamentations such as triangles) moved down near the end of the long shafts; the symbols are joined at their endpoints (opposite the ticks or ornamentations) at the point of observation.

3.6.2 Linear-Feature Geologic Point Data

Linear-feature geologic point data consist of quantitative information about the orientation of a geologic or geomorphic linear feature, which may be a physical line (for example, a fault-plane groove or slickenline) or a hypothetical line (for example, the intersection of two surfaces of deformation). The geologic or geomorphic linear feature may be horizontal, inclined, or vertical.

Two measurements, the *bearing* and the *plunge*, define the orientation of a geologic or geomorphic line in three-dimensional space:

- the *bearing* of a line is the azimuthal direction of the trend of that line, as measured in its direction of plunge;
- the *plunge* of a line is the angle of departure of that line downward from horizontal.

Information about the type of observation, as well as the values of bearing and plunge, is specified as attributes in the geologic map database. Such information also is represented on the geologic map by specialized point symbols and associated annotation: the bearing value and the direction of plunge are implicit in the orientation of the point symbol; the plunge value is added as annotation.

3.6.2.1 Point Symbols for Linear Features, and Their Placement Relative to Point of Observation

The point symbols for inclined linear features typically are made up of two parts: a shaft oriented in the bearing direction, and an arrowhead pointing in the plunge direction. The symbol is placed on the map so that the end of its shaft opposite the arrowhead is at the point of observation. When data have been collected about the local orientation of a linear feature that has been represented on the map by a line symbol (for example, a lineation on a fault), the point symbol is placed directly on the line symbol at the point of observation.

The point symbols for horizontal linear features are similar to those for inclined linear features, except that arrowheads are at both ends of the long shaft. The symbol is placed on the map so that the middle of its shaft is at the point of observation.

The point symbols for vertical linear features, which display no directional information, are simply placed on the map at the point of observation.

In situations where more than one observation has been taken at a single locality, point symbols for linear features can be combined with other point symbols at the point of observation. When a single linear-feature observation and a single planar-feature observation are taken at a single locality, the symbols are combined so that the end of the arrow that represents the linear feature is placed at the intersection of the planar-feature point symbol's long shaft and short tick (or ornamentation). When more than two such observations are taken at a single locality, the point symbols for linear features are joined at their endpoints with the specialized point symbols for planar features (see Section 3.6.1.2 above, entitled "Specialized Planar-Feature Point Symbols for Multiple Observations at One Locality") at the point of observation.

3.6.3 Informational Geologic Point Data

Informational geologic point data consist of geologic information that is supplemental to a typical geologic map or its features. Informational geologic point data are divided into two types: *locality-information point data*, and *line-symbol decorations*.

3.6.3.1 Locality-Information Point Data

Locality-information point data record information collected at a particular locality (for example, fossil localities or sample localities). The type of data collected at the locality is specified as a feature attribute in the geologic map database. In addition, such information commonly is represented on the geologic map by a specialized point symbol placed at the point of observation. Sample numbers or other identifying labels are added as annotation near the point symbols.

3.6.3.2 *Line-Symbol Decorations*

Line-symbol decorations are specialized point symbols that convey qualitative information about the character of a particular line or line segment (for example, anticline arrows or ball-and-bar symbols). The type of line-symbol decoration is specified as a feature attribute in the geologic map database. Line-symbol decorations are not placed at a specific point of observation because they do not represent information collected at a particular locality; instead, they should be placed at a strategic location (or locations) along the trace of a line symbol in order to clearly communicate information about the nature of that line.

4. SCIENTIFIC CONFIDENCE AND LOCATIONAL ACCURACY OF GEOLOGIC FEATURES

Another important concept in geologic mapping is a geologist's level of confidence in the interpretation of features observed in the field. Many factors can adversely affect a geologist's level of confidence when mapping, and field situations often arise in which the interpretation of a feature may be in question, as indicated by the following examples:

- a planar feature is well-exposed in outcrop, but it is not easily identifiable as either a contact or a fault;
- a contact is clearly exposed in a roadcut, but its trace cannot be followed away from that roadcut;
- a fault's trace is obscured by vegetation, and so both its location and its sense of offset cannot be definitively determined;
- a fault's trace is completely concealed beneath valley fill.

As these examples show, uncertainties can exist in either the scientific interpretation or the mapped location of a feature (or in both). Therefore, not only is it important to communicate to the map user the level of confidence in each geologic map feature, but also which type of uncertainty (scientific and (or) locational) may be associated with that feature.

Traditionally, a system of solid, dashed, dotted, or queried line symbol styles (see, for example, Ridgway, 1920, plate 2) has been used on geologic maps to show levels of locational accuracy of planar and linear geologic features observed in the field. This convention followed USGS Director Powell's 1888 policy, which stipulated that "fault lines (particularly when they are formation boundaries) shall be indicated when actually traced by somewhat heavy full lines in black; and when not actually traced, by similar broken lines" (Powell, 1890, p. 76). More guidance was provided in 1956 by USGS Chief Geologist W.H. Bradley, who, in a memorandum to USGS personnel regarding geologic map standards, stated, "The accuracy of location of faults and contacts should be shown by appropriate symbols ... Solid lines should be used to indicate accurate locations of features that are geologically identifiable within the plottable limits of the map ... Features that are only approximately located should be shown by long dashed lines; those that are indefinite or inferred, by short dashed lines; and those that are concealed, by dotted lines" (W.H. Bradley, written commun., 1956). To further encourage the use

of such symbology, Bradley added, "The use of many dashed contacts or faults on a map is not to be construed as a detraction from the quality of the map, and for many maps, it may be undesirable or impossible to achieve sufficiently accurate locations to permit use of solid lines. The quality of the map is not impaired so long as the reader can interpret the accuracy of location" (W.H. Bradley, written commun., 1956).

In conjunction with these traditional line symbol styles, geologists at various times have used terms such as "known," "probable," "certain," "uncertain," "accurately located," "approximately located," "inferred," "projected," "concealed," and "queried" to express the levels of confidence of planar and linear geologic features. However, these terms and their associated line symbol styles have not been used consistently from region to region or from map to map. Also, it has not been always clear whether they reflect uncertainty in a feature's scientific interpretation, its mapped location, or both.

To facilitate the communication of geologic map information, this standard clarifies the concepts of, and establishes the attributes for, the levels of scientific confidence and locational accuracy of geologic map features. In addition, to facilitate the cartographic representation of geologic map information, this standard establishes new terminology that expresses both these concepts.

4.1 SCIENTIFIC CONFIDENCE

Scientific confidence expresses a geologist's level of certainty regarding the nature, origin, geometry, identity, and even the existence of a geologic feature. The characteristics of the geologic materials and structures, the number of outcrops, and the availability of subsurface or geophysical data directly affect the level of scientific confidence in any area. Experience and resources available to a geologist also affect scientific confidence. These fundamental characteristics of geologic features can be grouped into two distinct but related concepts, *identity* and *existence*.

4.1.1 Identity

Identity expresses whether or not the observations and data support the stated nature, origin, or geometry of a mapped geologic feature (for example, a contact versus a fault, or a normal fault versus a thrust fault). The concept of identity is communicated in the following two ways:

- in the geologic map database, the attribute describing the confidence in a feature's identity is specified as either *certain* or *questionable*;
- on the geologic map, the confidence in a feature's identity is communicated in the symbol explanation and (or) the map unit description (see Section 4.1.3 below, entitled "Levels of Scientific Confidence") and also, for some types of geologic map features, conveyed cartographically (see Section 4.1.4 below, entitled "Cartographic Representation of Scientific Confidence").

4.1.2 Existence

Existence expresses whether or not the observations and data support the continuity or existence of a concealed

or an otherwise unseen geologic feature (for example, a postulated fault or a subsurface fault). The concept of existence is communicated in the following two ways:

- in the geologic map database, the attribute describing the confidence in a feature's existence is specified as either *certain* or *questionable*;
- on the geologic map, the confidence in a feature's existence is communicated in the symbol explanation and (or) the map unit description (see Section 4.1.3 below, entitled "Levels of Scientific Confidence") and also, for some types of geologic map features, conveyed cartographically (see Section 4.1.4 below, entitled "Cartographic Representation of Scientific Confidence").

4.1.3 Levels of Scientific Confidence

A geologic map must communicate to the map user the level of scientific confidence associated with each mapped feature (both its identity and its existence). In a geologic map database, this information is contained in two attribute fields, identity (*certain*, *questionable*), and existence (*certain*, *questionable*). To facilitate the communication of the two concepts of identity and existence on a geologic map, this standard sets forth the following new terminology, which expresses clearly yet concisely the levels of scientific confidence of geologic features (see figure 1 for the relation of this new terminology to historically used terminology):

"Identity and existence certain"	Both the identity and the existence of a feature can be determined using relevant observations and scientific judgment; therefore, one can be reasonably confident in the scientific credibility of this interpretation. These criteria are met, for example, when a geologist reasons, " <i>I am certain that the planar feature I see in this outcrop is a fault.</i> " This is the default condition for all geologic map features unless otherwise stated on the geologic map or in the geologic map database.
"Identity or existence questionable"	Either the identity or the existence of a feature cannot be determined using relevant observations and scientific judgment; therefore, one cannot be reasonably confident in the scientific credibility of this interpretation. These criteria are met, for example, when a geologist reasons, " <i>I can see some kind of planar feature in this outcrop, but I cannot be certain if it is a contact or a fault,</i> " or, " <i>My interpretation requires that a thrust fault be present to account for incongruities in the stratigraphy of these rocks, but I can't be certain because I haven't yet seen one here.</i> "

This new terminology is intended to be used when choosing a particular style of symbol to represent a feature on a geologic map (fig. 2), as well as when describing that feature in the symbol explanation and (or) the map unit description. If a feature is symbolized or described as "identity or existence questionable," the map user should consult the geologic map database for more complete information.

1069

Symbol style ¹	Examples of historically used terminology	Newly revised FGDC standard terminology	Scientific confidence		Locational confidence	
			Identity ...	Existence ...	Location (in field) ...	Position (on map) ...
—————	certain; known; accurately located	identity and existence certain, location accurate ²	certain	certain	observable	within zone of confidence ⁶
—————?—————	[not available for newly defined symbol]	identity or existence questionable, location accurate	may be questionable	may be questionable	observable	within zone of confidence
—————	approximately located	identity and existence certain, location approximate ³	certain	certain	observable	may not be within zone of confidence
—————?—————	approximately located, queried	identity or existence questionable, location approximate	may be questionable	may be questionable	observable	may not be within zone of confidence
—————	inferred; probable; projected	identity and existence certain, location inferred ⁴	certain	certain	inferred (between outcrops or beneath rubble or vegetation)	may not be within zone of confidence
---?---?---?---	inferred, queried	identity or existence questionable, location inferred	may be questionable	may be questionable	inferred (between outcrops or beneath rubble or vegetation)	may not be within zone of confidence
-----	concealed; projected	identity and existence certain, location concealed ⁵	certain	certain	concealed (beneath overlying map unit, ice, or water)	may not be within zone of confidence
-----?-----?-----?	concealed, queried	identity or existence questionable, location concealed	may be questionable	may be questionable	concealed (beneath overlying map unit, ice, or water)	may not be within zone of confidence

¹ Queries are added to symbols to indicate that a feature's scientific confidence (that is, either its identity or its existence) may be in question.

² The term "location accurate" is used when a feature is observable, and its plotted position on the map is within the zone of confidence.

³ The term "location approximate" is used when a feature is observable, but its plotted position on the map may not be within the zone of confidence.

⁴ The term "location inferred" is used when a feature's location must be inferred between outcrops or beneath rubble or vegetation, and so its plotted position on the map may not be within the zone of confidence.

⁵ The term "location concealed" is used when a feature is concealed beneath an overlying map unit, ice, or water, and so its plotted position on the map may not be within the zone of confidence.

⁶ The zone of confidence for a particular map or mapped area is specified by the mapping geologists and their agencies.

Figure 1. Diagram showing relation of new FGDC standard terminology to historically used terminology and to traditional line symbol styles.

1070

1071

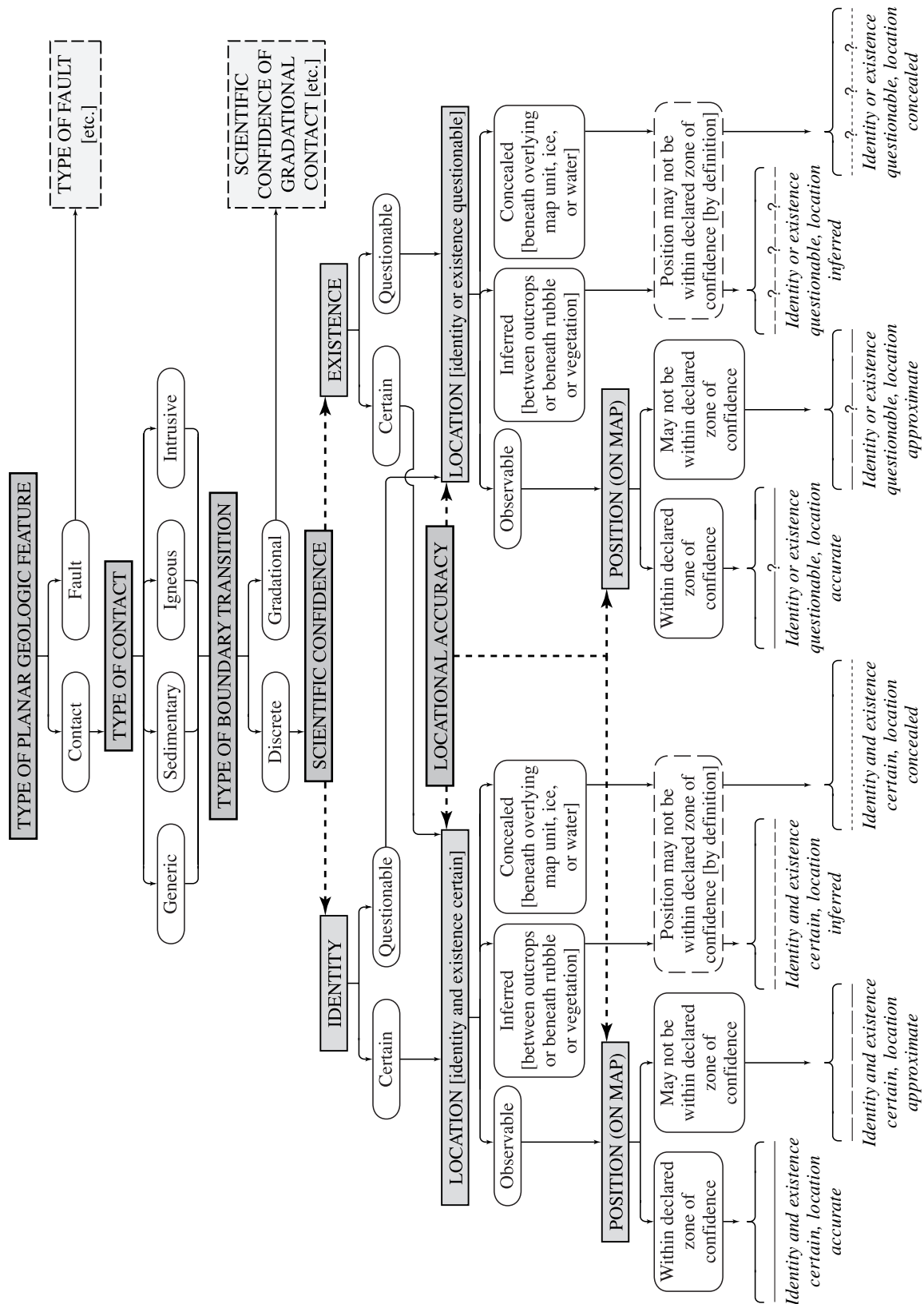


Figure 2. Flowchart showing example of logical steps that might be used to determine appropriate line symbol styles and associated terminology (in italics).

1072

4.1.4 Cartographic Representation of Scientific Confidence

For most types of geologic map features, queries are used to communicate the lack of scientific confidence in a feature. A queried line symbol indicates that either the identity or the existence of a planar or linear feature may be in question (figs. 1,2; see also, Appendix A); the map user should consult the geologic map database for more complete information. In contrast, a line symbol without a query most likely indicates that both the identity and the existence of a planar or linear feature are certain, unless otherwise stated in the geologic map database.

For geologic point data, queries are not added to point symbols to indicate that the scientific confidence of a feature may be in question. However, a limited amount of specialized symbology has evolved to express the scientific confidence of certain types of geologic point information; for example, to indicate that the direction of stratigraphic top is known, a small ball may be added to bedding and foliation symbols (see Appendix A, Sections 6 and 8, respectively). In addition, queries may be added to dip or plunge values, both on the geologic map and in the geologic map database, if those measurements are questionable.

A queried map-unit label indicates that either the identity or existence of the geologic map unit may be in question.

4.2 LOCATIONAL ACCURACY

Locational accuracy is based on the relation between a mapped feature's location in the field and its position on the base map. Information about the locational accuracy of mapped features is important to all disciplines, even those in which mapped features commonly are directly observable and can be positioned with a significant degree of accuracy (for example, roads or utilities). It is especially critical in the natural sciences, however, because many mapped features are either interpretive or not directly observable.

The process of locating a feature in the field and then positioning it on a base map is complex, and the locational accuracy of a mapped feature is not easily described or quantified. To evaluate the locational accuracy of a mapped feature, a geologist must consider the following three factors:

- the nature of the feature and its degree of exposure (for example, a contact may be gradational or sharp, and either poorly exposed or well-exposed);
- the quality of the base map (for example, whether the cultural or topographic features on the base map are positioned accurately, according to the geologist's observations);
- the confidence in accurately positioning the feature relative to the base-map information.

Together, these factors determine a geologist's confidence in the locational accuracy of the features on the map. Locational accuracy is expressed by two distinct but related concepts, *locatability* and *positioning*.

4.2.1 Locatability

Locatability expresses whether or not a geologist can clearly observe a feature *in the field*, as indicated by the following examples:

- a planar or linear feature is observable in several outcrops along its trace;
- a planar or linear feature is observable in only a few outcrops along its trace, but its physical characteristics permit locating it between outcrops by indirect methods;
- a planar or linear feature is not defined by a distinctive physical trace and so is not observable beneath either vegetation, a thin veneer of unmapped geologic material (colluvium, eolian deposits, or residual soil), or man-made features, therefore its location must be inferred by indirect means;
- a planar or linear feature is not observable because it is concealed by an overlying geologic map unit, although it may be observable nearby (for example, a thrust fault is visible on both sides of a glacial valley, but its location within the valley is concealed by ice), and so its location must be projected beneath the overlying map unit.

As the above examples show, uncertainty in a feature's locatability can arise in a number of geologic situations. The concept of locatability is communicated in the following two ways:

- in the geologic map database, the attribute describing the confidence in a feature's locatability is specified as either *observable*, *inferred*, or *concealed*;
- on the geologic map, the confidence in a feature's locatability is communicated in the symbol explanation and (or) the map unit description (see Section 4.2.3 below, entitled "Levels of Locational Accuracy") and also, for some types of geologic map features, conveyed cartographically (see Section 4.2.4 below, entitled "Cartographic Representation of Locational Accuracy").

4.2.2 Positioning

Positioning expresses the degree of confidence with which a feature is plotted *on the base map*. Commonly, a feature can be accurately plotted on the map because the base-map information is accurate, detailed, and distinctive. However, in some field situations, a feature cannot be confidently plotted on the base map, as indicated by the following examples:

- a feature is observable, but its position on the map cannot be plotted accurately because topographic contours, drainage lines, or cultural information on the base map is insufficiently detailed for the feature to be confidently located relative to the various base-map features (for example, a contact is observable in outcrop, but its location in relatively featureless terrain prevents its position from being plotted accurately on the base map);
- a feature is observable, and its geographic coordinates can be determined in the field by using either a Global

Positioning System (GPS) device or in the laboratory by using a georeferenced aerial photographic stereopair; however, the geographic relation between these coordinates and the topographic or cultural setting shown on the base map is not compatible (for example, a feature was mapped on a hillside, but the GPS-derived coordinates, when plotted on the base map, place its position in a valley bottom).

In such situations, either a feature can be plotted relative to the indistinct or incompatible base-map features, or the locations of topographic contours or other base-map features can be adjusted (the latter approach is not encouraged unless it is done systematically and is well-documented). In either case, the inherent uncertainty in a feature's positioning must be communicated to the map user, both on the geologic map and in the geologic map database (see discussion in Section 4.2.2.1 below, entitled "Specifying Positional Accuracy with the Zone of Confidence").

In the USGS, stringent policies for the accuracy with which an observable feature can be positioned on the base map have been put forth in the past. For example, Chief Geologist W.H. Bradley's 1956 memorandum to the staff advocated a geologic map accuracy standard based on the United States National Map Accuracy Standards (NMAS) for topographic and other types of base maps. The geologic map adaptation of the NMAS stipulated that "features that ... can be located from exposures or other evidence [should be positioned] within 1/25 inch [on the map] of their true map position" (W.H. Bradley, written commun., 1956; see also, U.S. Geological Survey, 1995a, Part 1, p. 1.0-4). These earlier efforts to quantify the positional accuracy of geologic features were not widely adopted by the geoscience community, likely in part because of (1) the difficulty in translating to geologic mapping a concept designed for topographic and other types of base maps, (2) the impracticality of requiring that all geologic map information meet the same accuracy criteria uniformly across the Nation, in all types of geologic and topographic settings, and (3) the need to convert ground distance to publication-scale cartographic units before evaluating if a feature is plotted accurately on a base map.

In contrast, this standard advocates a more flexible and conceptually simpler approach in which the accuracy criteria can be defined for each project so that the specified positional accuracy takes into account the character of the geologic setting and other factors (see below). In addition, if the geologic map adaptation of the NMAS (1/25 inch on the map) has been used when mapping, this value can be specified (1/25 inch on the map must first be converted to ground units).

4.2.2.1 Specifying Positional Accuracy with the Zone of Confidence

When a feature is drawn or digitized onto a base map, a geologist commonly has some sense of confidence regarding whether or not the feature is positioned accurately, depending on the quality of the base map and the ability to position features on that base map. This positioning confidence can be characterized as the likelihood that the feature actually occurs within a certain, roughly defined distance from where it is positioned on the base map. This hypothetical distance, which extends outward from a feature's position on the map, is herein defined as the *zone of confidence*, and its numerical value quantifies a feature's positional accuracy as follows:

1171

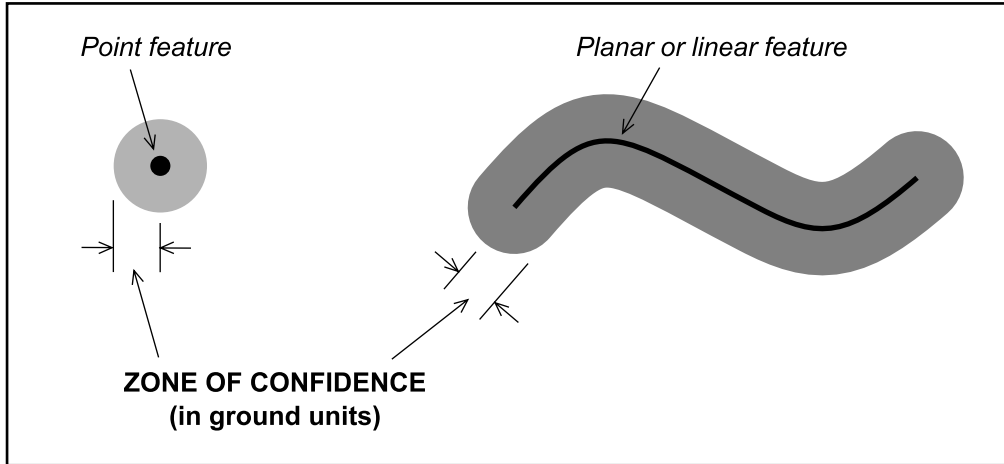


Figure 3. Figure showing examples of the zone of confidence for planar, linear, and point features. The region within which a *point* feature can be considered to be accurately positioned (on a base map) is a circle (light-shaded area above) around the point, and the value of the zone of confidence is the radius of that circle, in ground units. For a *planar* or *linear* feature, the region is a buffer zone (dark-shaded area above) surrounding the line, and the value of the zone of confidence is the distance from the line to the edge of the buffer zone, in ground units.

1172

1173 • for planar and linear geologic features, the *zone of confidence* borders the feature along both sides, forming
1174 what is described in GIS terminology as a buffer zone, and its numerical value is specified as the
1175 approximate distance in ground units (feet or meters) from the feature to the edge of the buffer zone (fig. 3);

1176 • for geologic point features, the *zone of confidence* is concentric around the feature, forming a circle, and its
1177 numerical value is the approximate radius of that circle (fig. 3).

1178 For any geologic map or mapped area, the numerical value of the zone of confidence will depend on a number
1179 of factors: the area's geology, landscape terrain, vegetation cover, and (or) cultural features; the scale of
1180 mapping; the quality and nature of the base map used; and (or) a particular project's allotted field-mapping time
1181 or other logistical constraints. Because this standard recognizes that the factors affecting the value of the zone of
1182 confidence will vary from region to region (and from map to map), and because different agencies have
1183 differing mapping needs and mandates, a single, universally applicable value for the zone of confidence is not
1184 herein established. Instead, this standard advocates that the responsibility for setting the value of the zone of
1185 confidence for a particular geologic map or mapped area lies with each geoscience organization and each
1186 mapping geologist.

1187 In the geologic map database, the attributes describing positioning confidence, which are expressed in terms of
1188 the zone of confidence, are as follows:

1189 • a numerical value for the zone of confidence is specified (for example, 5 meters);

- a feature's positioning is specified as being either "*within zone of confidence*" or "*may not be within zone of confidence*" (note that this standard does not stipulate that a feature whose positioning is specified as "*may not be within zone of confidence*" must *necessarily* be located outside the zone of confidence, but simply that it *may* be).

On the geologic map, positioning confidence is communicated in the symbol explanation and (or) the map unit description (see Section 4.2.3 below, entitled "Levels of Locational Accuracy") and also, for some types of geologic map features, conveyed cartographically (see Section 4.2.4 below, entitled "Cartographic Representation of Locational Accuracy"). In addition, the numerical value of the zone of confidence is indicated, either in a general statement (if one value applies to the entire mapped area) or shown in an index map (if different values apply to different mapped areas; see Section 4.2.2.2 below, entitled "Accommodating Different Values of the Zone of Confidence"). Likewise, if the geologic map adaptation of the NMAS (1/25 inch on the map, converted to ground units) has been used during field mapping as a measure of positioning confidence, or if a zone of confidence was not used during field mapping or map compilation, this also is indicated.

4.2.2.2 Accommodating Different Values of the Zone of Confidence

For many geologic maps or mapped areas, especially those that are defined by latitude and longitude (for example, quadrangle maps) or political boundaries (for example, state or county maps), one map may contain areas of vastly contrasting geology, topography, vegetation cover, and (or) societal infrastructure, and so different positional accuracy criteria can exist within a single map. For example, a geologic map may include both a mountain range underlain by well-bedded sedimentary rocks and a broad alluvial valley underlain by mostly surficial deposits. In the mountains, clear distinction among the sedimentary rocks, as well as their high relief, may provide a geologist with a significantly higher sense of confidence in the position of contacts than in the adjacent valley, where few topographic landmarks or contours exist and where contacts may be gradational and obscured by vegetation and soil cover. In geologic settings as diverse as these, the levels of confidence in positional accuracy will be different, and so a geologist has the following two choices:

- express the differences in positioning confidence solely by differences in symbology (for example, specify one zone of confidence value for both areas, which might result in mostly solid-line contacts in the mountains and mostly dashed- or dotted-line contacts in the valley);
- express the differences in positioning confidence by specifying different values of the zone of confidence for each area (for example, specify the zone of confidence value as 5 meters in the mountains and 15 meters in the valley).

The choice might depend on the magnitude of the difference between the areas, or on the geologist's level of confidence in the positional accuracy of features across the map area.

Map compilations represent another example where different positional accuracy criteria can exist within a

single map. A map compilation is made up of several source maps or mapped areas, each of which may have had a different value specified for the zone of confidence (or perhaps no value had been specified). These variations in the specified value of the zone of confidence should be preserved in the map compilation as well.

In situations in which the numerical values of the zone of confidence are different for different areas across the geologic map, the differences must be communicated to the map user. In the geologic map database, variations in the value of the zone of confidence can be readily accommodated because each feature is assigned (as an attribute in the database) the value of the zone of confidence that has been specified for a particular area. On the geologic map, areas that have different values of the zone of confidence should be shown in an index map.

4.2.3 Levels of Locational Accuracy

A geologic map must communicate to the map user the level of locational accuracy associated with each mapped feature (both its locatability in the field and its positioning on the base map). In the geologic map database, this information is contained in the following three attribute fields: (1) locatability (*observable, inferred, concealed*); (2) positioning (*within zone of confidence, may not be within zone of confidence*); and (3) the numerical value of the zone of confidence (for example, *5 meters*).

To facilitate the communication of the two concepts of locatability and positioning on a geologic map, this standard sets forth the following revised terminology, which expresses clearly yet concisely the levels of locational accuracy of geologic features (see figure 1 for the relation of this revised terminology to historically used terminology):

"Location accurate" A feature is observable, and its plotted position on the map is within the declared zone of confidence. These criteria are met, for example, when a geologist reasons, *"I can clearly see this contact in outcrop, and I can accurately plot its position on the map."* This is the default condition for all geologic map features unless otherwise stated on the geologic map or in the geologic map database.

"Location approximate" A feature is observable, but its plotted position on the map may not be within the declared zone of confidence. These criteria are met, for example, when a geologist reasons, *"I can see this contact in outcrop, but I can't tell exactly where it is located because I am surrounded by trees,"* or, *"I can see this contact in outcrop, but the poor quality of my base map prohibits me from accurately plotting its position,"* or, *"I can see that the width of the gradational contact between these two map units exceeds my value of the zone of confidence, and so, although my base map is of high quality, my confidence in the accuracy of its plotted position is not high."*

"Location inferred" A feature is not directly observable between outcrops or beneath rubble or vegetation, so its location must be inferred by indirect means; by definition, its plotted position on the map may not be within the declared zone of confidence. These criteria are met, for

1258 example, when a geologist reasons, "*I can see by the change in debris materials*
1259 *visible around these gopher holes that a contact runs through here, but I can't locate*
1260 *it very precisely.*"

1261 "*Location concealed*" A feature is not observable because it is completely concealed beneath an overlying
1262 map unit or body of water or ice (although it may be observable nearby); by
1263 definition, its plotted position on the map may not be within the declared zone of
1264 confidence. These criteria are met, for example, when a geologist reasons, "*I can see*
1265 *that a contact is present on both sides of this lake, but I can't tell where it is located*
1266 *beneath the water.*"

1267 This revised terminology is intended to be used when choosing a particular style of symbol to represent a
1268 feature on a geologic map (fig. 2), as well as when describing that feature in the symbol explanation and (or) the
1269 map unit description.

1270 **4.2.4 Cartographic Representation of Locational Accuracy**

1271 A system of solid, dashed, dotted, and queried line symbols has long been used on geologic maps to convey the
1272 uncertainty of planar and linear geologic features (fig. 1), but it has not always been clear whether these line
1273 symbol styles reflect uncertainty in a feature's scientific interpretation, its mapped location, or both. This
1274 standard clarifies the use of these line symbols (figs. 1,2) by applying its revised terminology for locational
1275 accuracy (see Section 4.2.3 above, entitled "Levels of Locational Accuracy") to the following line symbol
1276 styles²:

- 1277 • a solid, continuous line symbol indicates that the location of a feature is accurate; that is, its location in the
1278 field either is readily observable in outcrop or is revealed by the characteristic geomorphic expression of its
1279 trace, without extensive cover of thin overlying surficial deposits, and is verifiable by shallow excavations;
1280 in addition, it can be accurately plotted because base-map information is accurate, detailed, and distinctive,
1281 and so its position on the base map is within the declared zone of confidence.
- 1282 • a long-dashed line symbol indicates that the location of a feature is approximate; that is, its location in the
1283 field either is readily observable in outcrop or is revealed by the characteristic geomorphic expression of its
1284 trace, without extensive cover of thin overlying surficial deposits, and is verifiable by shallow excavations;
1285 however, it cannot be accurately plotted because base-map information is inaccurate, indistinct, or
1286 incompatible with the location of the geologic feature, and so its position on the base map may not be within
1287 the declared zone of confidence.
- 1288 • a short-dashed line symbol indicates that the location of a feature is inferred; that is, its location in the field
1289 generally is obscured by overlying (unmapped) surficial deposits, debris materials, or vegetation that may

² Note that this standard restricts the use of queries to represent the lack of scientific confidence only (see discussion in Section 4.1.4 above, entitled "Cartographic Representation of Scientific Confidence").

cover exposures and the geomorphic expression of its trace, and has therefore been projected between few outcrops; by definition, its position on the base map may not be within the declared zone of confidence.

- a dotted³ line symbol indicates that the location of a feature is concealed; that is, its location in the field is covered by an overlying, mapped geologic unit, ice, or water; by definition, its position on the base map may not be within the declared zone of confidence.

These types of line symbol styles (solid, long-dashed, short-dashed, and dotted) are intended to be used to convey the various levels of locational accuracy of planar and most types of linear geologic features.

The locational accuracy of a geologic map unit is not expressed by a specialized symbol but, instead, by the style of line symbols representing the planar features (contacts and faults) that bound it.

In most cases, specialized point symbols are not used to indicate that the locational accuracy of a geologic point feature may be in question. One exception is the specialized symbols that are used to portray bedding attitudes that have been determined using aerial photographs (see Appendix A, Section 6); however, these symbols also may be used to indicate that the scientific confidence (the measurement of dip) is in question, and so, when these types of symbols are used on a geologic map, the map user should consult the geologic map database for more complete information.

5. GUIDELINES FOR MAP COLOR AND PATTERN SELECTION

The goal in color design is to enhance the legibility of the map, as well as to lend meaning to the data presented by helping to focus attention on a particular map feature or group of features. Colors and patterns should not, however, be so visually dominant as to distract from the purpose of the map. A well-balanced color design can greatly improve the presentation of scientific information.

5.1 FACTORS THAT INFLUENCE COLOR AND PATTERN SELECTION

5.1.1 Purpose of Map

Color is used differently on different types of maps. For example, on geologic maps, color is primarily determined by age and type of rock, although other rules may apply for terrane maps or maps that portray only a limited range of ages or types of rocks. In addition, some map units, because of their geologic or economic importance, may need to be emphasized by selected colors.

Geophysical maps use several color schemes, depending on the purpose of the data being shown; usually a range of colors from dark to light is used. One such scheme is a graduated set of hues of similar value (for example, purple and magenta to orange and red). Another is a rainbow of hues in which the values alternate between full color and lightly screened color.

³ In reality, dotted line symbols that are thinner than a certain lineweight are difficult to produce with some software applications; therefore, this standard substitutes a very-short-dashed line symbol as the cartographic standard (see figures 1,2; see also, Appendix A).

On slope-stability maps, the brightest colors are used on areas of highest instability. Similarly, on volcanic- or earthquake-hazard maps, areas of greatest hazard usually are shown in red, whereas areas of lowest hazard are shown in yellow or green.

Data on hydrologic maps are frequently shown in two or three colors. On maps showing depth to water table, color ranges from light blue at the shallowest depths to dark blue at the greatest depths. On maps showing dissolved-solids concentrations, color ranges from dark blue where concentration is lowest to dark red where concentration is highest.

5.1.2 Age and Type of Rock

Whenever possible, colors for ages and rock types on geologic maps should follow the scheme presented in the diagram showing "Suggested Ranges of Map-Unit Colors for Volcanic and Plutonic Rocks and for Stratigraphic Ages of Sedimentary and Metamorphic Rocks" (see Appendix A, Section 33). However, it may not always be feasible to show map units in the suggested color; in these cases, other characteristics should be emphasized with color.

On surficial maps, for example, it may be desirable to show all glacial deposits in one color, landslide deposits in another, lacustrine deposits in another, and alluvial deposits in yet another. On terrane maps, color may be used to show lithotectonic relations between various groups of rocks.

On maps that are mostly one age group, it is best to distinguish sedimentary rocks from volcanic rocks (usually shown in reds or other bright colors) and plutonic rocks (usually shown in pinks). On maps that are mostly one type of rock, differentiation between different rock sequences can be shown through the use of different colors.

On maps that cover a broad range of ages and rock types, relations between rocks within one age group can be shown by using similar colors, whereas relations between the same type of rock in different age groups can be shown by using patterns (for example, all volcanic rocks may have the same "v" pattern). Patterns should be used sparingly, however, as their use can create an overly busy appearance; use them only when the complexity of the map requires the diversity achieved by the use of patterns.

Although it is preferable to follow the aforementioned guidelines, some rock types defy such guidelines because they traditionally have been shown in a particular color. For example, serpentinite and other ultramafic rocks characteristically are shown in purple; limestone usually is shown in bright blue; and glacial till often is shown in light green.

5.1.3 Size of Map-Unit Areas

In general, small map-unit areas should be shown in darker colors and large areas should be shown in lighter colors. An exception to this may be in situations when numerous small bands of map units are shown; in this case it may be best to alternate light and dark colors. In the case of map units that consist of both large and small areas, add labels and leaders to the smaller map units to avoid confusion. For guidelines and

recommendations on the placement of map-unit labels and leaders, see Section 6 below, entitled "Guidelines for Map Labeling."

Because it is more difficult to clearly distinguish color in small areas, it is very important to choose as unique a color as possible for map units that are present only in small areas. The minimum size of map-unit area that can show color is about two square millimeters; anything smaller will need to be labeled. In addition, exercise caution when using patterns in small areas because small areas may fail to show enough of the pattern to adequately identify a map unit; about one square centimeter is the minimum size to clearly show patterns. If there can be any ambiguity in a map-unit area's identification, it is safest to add a label and leader.

5.1.4 Contrast

Adequate contrast enhances readability. A key factor is not so much the difference in hue, such as blue or green, but the difference in intensity. Contrast should not, however, be so great as to be glaring, but it should be significant enough for easy legibility. Map units that need to be emphasized should be assigned colors that stand out and contrast well with the colors of less important units. In addition, greater contrast is required for small areas, whereas a more subtle contrast is sufficient for larger areas.

5.2 SPECIFYING COLOR FOR MAP-UNIT AREAS

To maintain control of color output, color on maps and illustrations should always be specified using process-color (CMYK, cyan/magenta/yellow/black) inks, regardless of the intended output medium. If another non-ink color scheme such as RGB (red/green/blue) or HSV (hue/saturation/value) is used, then the output device (be it printer, plotter, or imagesetter) will automatically convert the non-CMYK values to CMYK during output, and unwanted color shifts often will take place. To aid in the selection of color fill for map units, a chart showing a wide variety of CMYK colors ("CMYK Color Chart") has been included herein.

Color values must be high enough to provide adequate contrast but not so great that they prevent the map-unit labels, structure symbols, and topographic base from showing clearly. Except in small areas, magenta and cyan should be used in intensities of 50% or less. A greater intensity of cyan might obscure drainage features (commonly shown in cyan), and a greater intensity of magenta might obscure magenta fold axes and dikes.

As a general rule, use a combination of CMYK color values that, when added together, totals 100 or less (for example, 30% cyan/40% magenta/20% yellow; $30+40+20 = 90$), especially in larger areas.

To maintain enough contrast between two colors, keep at least a 20% difference between the values of one of the CMYK colors (for example, 30% cyan/8% magenta/20% yellow and 30% cyan/8% magenta/40% yellow).

Avoid using 8% yellow because it is too light and cannot easily be distinguished from white. In addition, it may be wise to avoid using 13% or 20% cyan, as these colors may look like a body of water.

On maps that are to be offset printed, it may be best to use a solid (100%) single-ink color such as cyan, magenta, or yellow in very small map-unit areas to avoid misregistration problems. For example, 100% cyan

may be used to show small limestone blocks in melange, or 100% magenta may be used to show thin rhyolite intrusions.

5.3 USE OF PATTERNS

Patterns can be printed either in black, in color, or as a dropout. Ideally, patterns should be used sparingly and only when necessary for clarification, as they can add unnecessary complexity to a map. To select appropriate patterns for a map, both the type of rock and the size and (or) orientation of map-unit areas must be considered. To aid in the selection of patterns for map units, a chart showing a wide variety of geologic patterns ("Pattern Chart") has been included herein.

Although some flexibility exists in the use of patterns, some patterns are traditionally and exclusively used for certain rock types: for example, "+" patterns are used for plutonic rocks, and irregular "v" patterns represent volcanic rocks. For map units that are present only in small areas, a tight, random pattern will fit more of the pattern elements into a particular area. Exercise caution, however, when choosing metamorphic patterns that display a strong directionality, as their use may imply a general orientation of metamorphic fabric that in reality is much more varied than the pattern may indicate.

5.3.1 Overprint Patterns

Color overprint patterns are usually specified in either cyan or magenta, but sometimes a spot color such as red is used. For offset printing, it is best to specify only one color for overprint patterns, as using more than one color can cause misregistration problems. Color overprint patterns can be screened to reduce their intensity.

Black overprint patterns are less effective than color in most situations, as they can conceal base-map information or interfere with type or structure symbols. Thus, it may be best to restrict the use of 100% black patterns to small, uncluttered areas; if a map-unit label is needed, it can be placed outside the area and leadered in. Black patterns also can be screened to reduce their intensity.

5.3.2 Dropout Patterns

Dropout patterns cause to be transparent one or more of the CMYK colors that combine to make a map-unit color, thus allowing the remaining color(s) to show through. Their use can be especially effective on a map that has a large amount of labeling or many structure symbols.

For offset printing, only one color should be dropped out, as dropping out more than one will lead to misregistration problems; in general, the most dominant color (the one with the highest value) other than yellow should be the one dropped out. For output to a single-pass inkjet plotter, a dropout pattern may be applied to all of the CMYK colors that make up a map-unit color; the dropout pattern would then show as white. Be aware, however, that doing so may cause that map unit to stand out more than is desired.

5.4 SPECIFYING COLOR FOR LINE AND POINT SYMBOLS

Color commonly is specified for many line and point symbols because it highlights these features. Whenever possible, color for line and point symbols should be specified as either 100% cyan or 100% magenta, two of the standard four process-color (CMYK, cyan/magenta/yellow/black) inks that are used for offset printing and in most inkjet plotters (other non-ink color schemes such as RGB or HSV should be avoided so that unwanted color shifts during output are prevented). However, in some cases it may not be practical or preferable to specify cyan or magenta; for example, mineral resource assessment areas traditionally have been outlined in red.

Although it is possible to make a non-process color such as red from two or more process-color inks, this should be avoided if the map is to be offset printed because of the difficulties in registering large, CMYK-separated negatives. For maps that are to be offset printed, a Pantone color (single-ink spot color) should be specified. Each Pantone color is imaged onto a separate piece of film, thereby avoiding misregistration problems caused when a color is converted to CMYK and then is color separated onto more than one piece of film.

6. GUIDELINES FOR MAP LABELING

Map-unit labels are the most common labels on geologic maps. Other labels may include base-map information, feature names, and data items such as dip values, gold concentrations, well depths, radiometric ages, and sample locality numbers.

Before the advent of digital technologies for mapmaking, labels were either drawn by hand or applied using stick-up type. Nowadays, using digital mapmaking techniques, labels (and leaders) can be automatically plotted from information in a database; however, this often results in labels overprinting other map features, requiring them to be interactively repositioned or deleted. Regardless of the method employed, effective label placement is an important factor in producing a useful map.

6.1 STRATEGIES FOR MAP LABELING

Enough features on the map should be labeled so that the reader can identify all of the various map elements; no unlabeled map feature should leave the reader guessing. Labels (and leaders) should not, however, create an overly "busy" or cluttered appearance, which makes recognition of map patterns and shapes and map-element distribution difficult to discern. For a map to be easily read, labels and leaders should be placed where they are clear and legible, taking care to avoid overprinting of linework, symbols, or other labels. In addition, they should not obscure base-map features that are mentioned in the text or that may be useful in locating places on the map.

Commonly, color or pattern can be used to identify an unlabeled map-unit area if a nearby area of the same map unit is labeled. Therefore, the color and pattern selection is critical when deciding whether or not to label a particular map-unit area, and so it is important to complete the color and pattern design of the map before

attempting to place and move map-unit labels, especially for complex maps or those that have many map units.

There are no precise rules for which and how many of the map-unit areas on a map should be labeled, but the following are some general guidelines. If a map unit has a unique and clearly distinguishable color or pattern, it is not necessary to label every area of that map unit. Color and pattern can carry the identification of a group of areas of the same unit as long as some of them are labeled. Use judgment when deciding whether the color for that map unit is distinctive enough and (or) whether a particular unlabeled map-unit area can be visually or logically associated with any nearby labeled areas of the same unit. In small map-unit areas, however, even the most distinctive color or pattern may be difficult to discern. If there might be any doubt, add a label and leader.

At least one area of every map unit within a "normal field of view" should be labeled. This field of view is the area in focus when the map is viewed at a comfortable, readable distance. In uncluttered areas of the map or in areas of relatively simple geology, this field of view might have a radius of about two or three inches; in geologically complex or cluttered areas, however, it may be much smaller. The reader should not need to search across the map trying to find a labeled map-unit area that has a color that matches an unlabeled map-unit area.

In addition, maps that are to be downloaded from the Web will be sent to a plotter of unknown type, and there is no guarantee that colors that appear distinct when plotted on your plotter will also be distinguishable when plotted on other plotters. The more map-unit areas that are labeled, the less chance of ambiguity and confusion.

6.2 FONT SELECTION

For most type on a map (for example, unit labels, dip values, and fault names), a sans-serif font such as Helvetica (or FGDC-GeoAge; see Appendix A, Section 32) should be used. Other sans-serif fonts such as Univers or Arial also may be used, but consider that not all fonts will plot correctly on all output devices. Also consider that combining FGDC-GeoAge with Univers or Arial will result in odd-looking character strings because the character size and kerning (spacing of letters) of FGDC-GeoAge is based on that of Helvetica; therefore, using Helvetica with FGDC-GeoAge is recommended. For base-map information, use a combination of sans-serif (for example, Helvetica or Univers) and serif (for example, Times or Times New Roman) fonts; the general rule is to follow the styles used on a published topographic map sheet.

When placing labels digitally, it is important to use the same font that will be used for final publication because the size and kerning of characters are different for different fonts, even those having the same point size. If labels are placed carefully in tight areas using one font, but then another font is used for final publication, the labels may overprint linework or other features because the new font may have longer character heights and string lengths. Therefore, for best results, choose fonts early in a project, and then stay with that choice throughout the project. In addition, the use of PostScript fonts may result in more consistent final output for both print and digital publications.

6.3 TYPE SIZE AND STYLE

The ideal size for map-unit labels is 8 pt, although labels as small as 6 pt may be substituted in places where space is tight. Fractional font sizes may be used if needed, and different sizes can be mixed on the same map. If unit labels contain subscripts or superscripts, the minimum unit-label size should be 7 pt; then the size for the subscript or superscript character would be 5 pt, two point sizes smaller.

Other sizes and styles are used to label different features. In general, use 8 pt type (all caps) for names of faults and major structures, for sample locality numbers and radiometric ages, and for fault (U/D, A/T) and contact (Y/O) ornamentation. Use 6 pt italic type for dip or plunge values. Use 12 pt italic type for cross-section labels. For labels of larger features, type size and (or) kerning (letter spacing) may be increased to improve legibility.

6.4 LABEL PLACEMENT

Labels for linear map features should be aligned along those features. Other labels should have a logical or comfortable orientation relative to the map. In rare cases it might be desirable to have labels run parallel to lines of latitude, but in general they should be oriented horizontally.

Map-unit labels and dip values should always be oriented horizontally. They should not overprint other map elements such as linework, point symbols, or any other dip values and labels, nor should they obscure base-map features that are referenced in text or are needed to orient the map in the field. Single labels can be used to identify more than one map-unit area; use multiple leaders where necessary.

Map-unit labels should not be placed in dark-colored map-unit areas or in densely patterned areas, both of which would make the labels hard to read; instead, move labels outside such areas and add leaders. If a label must be placed in a dark-colored or densely patterned map-unit area, it may be necessary to mask out the color or pattern around the label to help make it more legible.

6.5 LEADER PLACEMENT

Leaders should be drawn as straight lines, not bent or curved. They should cross map-unit area boundaries at as high an angle as possible, and they should not stop at the boundary but should extend well into the map-unit area. Leaders should not cross through other map-unit areas to reach a particular map unit unless absolutely necessary. Multiple leaders emanating from a single label should not be joined at their "label" ends.

7. TECHNICAL SPECIFICATIONS USED IN THE PREPARATION OF THIS STANDARD

This new standard (contained in Appendix A) consists of geologic line and point symbols, geologic map-unit colors and patterns, a geologic age symbol font, and related map marginalia. This section provides some technical discussion regarding preparation of the standard and its implementations.

7.1 UNITS FOR LINEWEIGHTS, LENGTHS, AND DISTANCES

In previous standards, lineweights were specified in thousandths-of-an-inch, which corresponded to the widths of the engraving tools used to scribe the linework. Most lengths and distances also were given in inches. In this standard, the cartographic specifications are given in millimeters, in accordance with the Federal standard for metrification.

The old thousandths-of-an-inch specifications have been converted to millimeters (table 1), and then most have been rounded to the nearest .05 mm or .025 mm, for ease of use. Whenever possible, cartographic specifications for lengths and distances have been given in whole- or half-integer values. However, when preparing the symbols in this standard document, as well as in its PostScript implementation, lineweights, lengths, and distances were specified in points, and the exact conversion values (from inches to points; see table 1) were retained.

As an example of the unit-conversion process, consider the symbol for faults, which in previous standards had a lineweight of .015" specified. This original lineweight was converted to millimeters (.015" = .381 mm; table 1) and then rounded to .375 mm, which is the value given as the cartographic specification in this standard (see p. A-2-1, Appendix A). However, when preparing the fault symbol for inclusion in this standard document (and in its PostScript implementation), the exact .015" lineweight was retained and directly converted to points (.015" = 1.08 pt; table 1), and so the symbol lineweight was defined electronically as 1.08 pt.

Complications from unit conversion can arise not just when designing line symbols but also when creating point symbols and patterns, as most symbols are made of stroked lines. When creating symbols for a particular application, the user should choose the unit of measure most easily used in an application and then use the conversion table (table 1) to convert to those units.

7.2 TYPE SPECIFICATIONS

Most type in this standard is specified as either Helvetica (sans-serif) or Times (serif), two fonts that are commonly used and widely available (see table 2 for abbreviations for type faces used in this standard); type sizes are given in points. Other fonts such as Univers, Arial, or Times New Roman may be substituted, but consider that they may not be installed on all common output devices and thus may not plot correctly.

Geologic age characters have been specified as FGDC-GeoAge, a specialized sans-serif font designed by the U.S. Geological Survey (see Appendix A, Section 32). The character size and kerning (spacing of letters) of FGDC-GeoAge is based on that of Helvetica; therefore, using Helvetica with FGDC-GeoAge is recommended.

7.3 COLOR SPECIFICATIONS FOR LINE AND POINT SYMBOLS

Color has been specified as the cartographic standard for many line and point symbols in this standard, either because of adherence to a long-established color convention or because using color for features such as folds and dikes may help them to stand out better from other full-black linework such as contacts and faults. In most

cases, another color or black may be substituted if the color specified as the standard would not be visible when printed over an underlying map-unit color.

Whenever possible, color has been specified as either cyan or magenta, two of the four process-color (CMYK, cyan/magenta/yellow/black) inks that are used both in inkjet plotters and for offset printing. However, in some cases it was not practical or preferable to specify cyan or magenta as the standard; for example, mineral resource assessment areas traditionally have been outlined in red (see p. A-19-1, Appendix A).

Although it is possible to make a non-process color such as red from two or more process-color inks, this should be avoided if the map is to be offset printed because of the difficulties in registering large, CMYK-separated negatives. Thus, in some cases a spot color (a single-ink, non-CMYK color) has been specified as the cartographic standard.

As a simple, general way of specifying spot colors, generic color names (for example, "red" and "green") have been used in this standard. Specifying color as these generic color names, however, may not be appropriate for use with certain output media. Therefore, the user must choose a method of specifying color that is appropriate for a particular output device; table 3 shows suggestions for conversions of spot colors to other color models.

For maps that are to be offset printed, a Pantone color (single-ink spot color) should be specified (table 3). Each Pantone color is imaged onto a separate piece of film, thereby avoiding misregistration problems caused when a color is converted to CMYK and then is color separated onto more than one piece of film. For output to an inkjet plotter, however, specifying a spot color as one of the generic color names is satisfactory because, during the plotter's RIP⁴ of the file, the color will automatically be converted to the proper amounts of CMYK inks that will combine to make the CMYK equivalent of that color. Misregistration is not a problem with single-pass inkjet-plotter output.

If simple, graphical map elements are to be published as part of a web page on the World Wide Web, it may be best to choose colors from a "Web-safe" color palette⁵ to avoid unwanted dithering on monitors that display only 256 colors (Weinman, 1996). As an aid in doing so, an attempt was made to provide "Web-safe" color equivalents of the Pantone spot colors used in this standard (table 3). These "Web-safe" color equivalents are made up of the RGB (red/green/blue) values that are as close as possible to the directly converted RGB-equivalent colors (table 3). Note, however, that it was impossible to exactly reproduce the directly converted RGB-equivalent colors because, to make "Web-safe" colors, there are only six possible RGB values (000, 051, 102, 153, 204, and 255) from which to choose.

⁴ RIP = raster-image processing, a process that runs on all plotters, printers, and imagesetters and converts data (in either raster or vector format) to printer dots to produce an image.

⁵ Industry opinions on using "Web-safe" colors (8-bit, 216 colors) are changing, owing to the large number of monitors now in use that can display more than 256 colors; Chris MacGregor (*in* Dennis, 1999) stated that using non-"Web-safe" colors may be acceptable to use in detailed areas, although she still recommends using "Web-safe" colors in large areas.

7.4 COLOR SPECIFICATIONS FOR MAP-UNIT AREAS

To aid in the selection of color fill for geologic map units, a chart showing a wide variety of CMYK colors ("CMYK Color Chart") has been included in this standard. The CMYK Color Chart was designed in Adobe Illustrator 8.0.1 to closely replicate the colors on the offset-printed color chart entitled "Printing Colors and Screens in Use by the U.S. Geological Survey for Geologic and Hydrologic Maps" [yellow/magenta/cyan version], which has been in use for many years at the USGS. The new color chart contains the same colors that were in the original offset-printed USGS chart; however, the old color codes indicating the YMC (yellow/magenta/cyan) values have been updated to show CMYK (cyan/magenta/yellow, with K=0) values, to conform to industry standards. In addition, each color in the CMYK Color Chart has associated with it a generic lookup-table number that, if desired, may be used to access the color from within digital applications.

In addition, a diagram showing "Suggested Ranges of Map-Unit Colors for Volcanic and Plutonic Rocks and for Stratigraphic Ages of Sedimentary and Metamorphic Rocks" (see Appendix A, Section 33) has been included in this standard. This diagram was designed in Adobe Illustrator 8.0.1 to reproduce a similar diagram in the old USGS Technical Cartographic Standards volume (U.S. Geological Survey, ca. 1975). In this new version, however, the range of colors was modified slightly, a few new colors were added, and the old color codes were updated to show CMYK (cyan/magenta/yellow, with K=0) values.

7.5 PATTERN SPECIFICATIONS

The old USGS Technical Cartographic Standards volume (U.S. Geological Survey, ca. 1975) contained no cartographic specifications (lineweights, dot sizes, or size and spacing of pattern elements) for its patterns. The volume dates back to a time when maps were conventionally prepared using hand-scribed linework and peelcoats. In those days, patterns were preprinted onto large sheets of film, which were photomechanically combined with the various peelcoats to make the CMYK negatives.

For this standard, the patterns (see "Pattern Chart") were recreated by scanning the old pattern sheets and then tracing the pattern elements in Adobe Illustrator 8.0.1. For most patterns, black, cyan, and magenta versions, as well as dropout versions, were created. Yellow versions were not created because yellow patterns are not visible over color fill. Also, red and (or) brown versions were created if red or brown patterns were specified as the cartographic standard for a particular feature. Glacial and hydrologic patterns were created only in cyan and black, as it is unlikely that magenta or other colors would be used for these types of patterns.

To facilitate digital output, lineweights and dot sizes were in many cases increased. A few pattern tiles were scaled to accommodate the increased lineweights, and some of the lined patterns were dropped because an increased lineweight would fill in the pattern and because an increase in scale would cause the pattern to be too similar to other patterns. The lineweights and dot sizes for the color and dropout versions were increased even more than for the black versions, to help them show more clearly on maps.

All patterns were renumbered, and suffixes indicating color were added so that all versions of the same pattern

are referenced by the same number. In addition, each pattern in the Pattern Chart has associated with it a generic lookup-table number that, if desired, may be used to access the pattern from within digital applications.

7.6 GEOLOGIC AGE SYMBOL FONT

A digital font named FGDC-GeoAge (see Appendix A, Section 32) has been created, in which 16 special geologic age characters have been substituted into positions of normal keyboard characters. These characters can be typed either directly or with the Shift key; no Option, Control, or Alt keys are needed to type these characters (they are all in lower-order ASCII positions that have character ID numbers below 128), allowing the same character positioning to work on different computer platforms without interfering with special control key sequences.

8. ACKNOWLEDGMENTS

This standard owes its existence mostly to the well-established history and traditions of geologic map cartography by the USGS. In particular, the editors and compilers of this standard wish to thank the many cartographers, editors, and geologists who contributed to the informal USGS "Technical Cartographic Standards" volume (U.S. Geological Survey, ca. 1975), as well as Mitchell Reynolds, James Queen, Richard Taylor, and others who were responsible for preparing the earlier (1995) USGS proposed standard (U.S. Geological Survey, 1995a,b), from which this standard has evolved. We especially wish to thank the many members of the USGS Geologic Discipline's Western Publications Group who have made substantial contributions to the design and preparation of this standard (see Section 2.3 above, entitled "Preparers of this Standard").

We also thank the numerous geologists, cartographers, graphics specialists, GIS specialists, editors, and others who provided invaluable comments and suggestions for revisions to this standard during their review(s) of the previous versions of this standard: the 1995 USGS proposed standard (see Soller, 1996); the preliminary, beta version of this standard; the Working Draft of this standard; and, most importantly, the Public Review Draft of this standard. In addition, we gratefully acknowledge the intellectual contributions of members of the standing Map Symbol Standards Committee (see section 2.3 above, entitled "Preparers of This Standard"), and especially Jonathan Matti (USGS) for his guidance on issues of scientific and locational confidence. Finally, we thank Jack Reed, Ron Wahl, Will Stettner, and Nancy Stamm (all USGS) for providing insight and access to USGS historical documents and standard cartographic practices.

9. REFERENCES

- Bates, Robert L., and Jackson, Julia A., eds., 1987, *Glossary of Geology* (3rd ed.): Alexandria, Va., American Geological Institute, 788 p.
- Berggren, W.A., Kent, D.V., Aubry, M-P, and Hardenbol, Jan, eds., 1995, *Geochronology, time scales, and global stratigraphic correlation*: SEPM (Society for Sedimentary Geology), Special Publication 54, 386 p.
- Dennis, Anita, ed., 1999, 101 hot tips: Publish, v. 14, no. 9, p. 62.
- Dietrich, R.V., Dutro, J.T., Jr., and Foose, R.M, compilers, 1982, *AGI data sheets for geology in the field, laboratory, and office* (2nd ed.): Alexandria, Va., American Geological Institute.
- Dutro, J.T., Jr., Dietrich, R.V., and Foose, R.M, compilers, 1989, *AGI data sheets for geology in the field, laboratory, and office* (3rd ed.): Alexandria, Va., American Geological Institute.
- Federal Geographic Data Committee, 2000, *Public Review Draft – Digital cartographic standard for geologic map symbolization*: Reston, Va., Federal Geographic Data Committee, 172 p., 2 plates.
- Gradstein, F.M., and Ogg, J.G., 1996, *A Phanerozoic time scale*: Episodes, v. 19, nos. 1-2, p. 3-5.
- Hansen, W.R., ed., 1991, *Suggestions to authors of the reports of the United States Geological Survey* (7th ed.): Washington, D.C., U.S. Geological Survey, 289 p.
- Haq, B.U., and van Eysinga, F.W.B., 1998, *Geological time table* (5th ed.): New York, Elsevier Science Publishing Co., 1 sheet.
- Harland, W.B., and others, 1982, *A geologic time scale*: Cambridge, England, Cambridge University Press, 131 p.
- Harland, W.B., and others, 1989, *A geologic time scale*: Cambridge, England, Cambridge University Press, 263 p.
- International Union of Geological Sciences (Juergen Remane, comp.), 1998, *International Stratigraphic Chart*: International Union of Geological Sciences, 1 sheet and explanatory text.
- Jackson, Julia A., ed., 1997, *Glossary of Geology* (4th ed.): Alexandria, Va., American Geological Institute, 769 p.
- North American Commission on Stratigraphic Nomenclature, 1983, *North American stratigraphic code*: American Association of Petroleum Geologists Bulletin, v. 67, no. 5, p. 841–75.
- Palmer, A.R., 1983, *The Decade of North American Geology 1983 Geologic Time Scale*: Geology, v. 11, no. 9, p. 503–4.
- Palmer, A.R., and Geissman, J., 1999, *1999 Geologic Time Scale*: Geological Society of America [available on World Wide Web at <http://www.geosociety.org/science/timescale/timescl.htm>].

- 1671 Powell, J.W., 1882a, Second Annual Report of the United States Geological Survey 1880-'81: Washington,
1672 D.C., U.S. Government Printing Office, 588 p.
- 1673 Powell, J.W., 1882b, Sur la nomenclature générale, sur le coloriage et les signes conventionnels des Cartes
1674 géologiques, *in* Congrès Géologique International, Compte Rendu de la 2me Session, Bologne, 1881:
1675 Imprimerie Fava et Garagnani, Bologne, p. 627–41.
- 1676 Powell, J.W., 1888, Methods of geologic cartography in use by the United States Geological Survey, *in* Congrès
1677 Géologique International, Compte Rendu de la 3me Session, Berlin, 1885: A.W. Schade's Buchdruckerei,
1678 Berlin, p. 221–40.
- 1679 Powell, J.W., 1890, Tenth Annual Report of the United States Geological Survey 1888–'89, Part I – Geology:
1680 Washington, D.C., U.S. Government Printing Office, 774 p.
- 1681 Ridgway, J.L., 1920, The preparation of illustrations for reports of the United States Geological Survey:
1682 Washington, D.C., U.S. Government Printing Office, 101 p.
- 1683 Snelling, N.J., ed., 1985, The chronology of the geological record: Geological Society of London, p. 261–6.
- 1684 Soller, D.R., 1996, Review of USGS Open-File Report 95–525 ("Cartographic and digital standard for geologic
1685 map information") and plans for development of Federal draft standards for geologic map information: U.S.
1686 Geological Survey Open-File Report 96–725, 12 p.
- 1687 U.S. Geological Survey, ca. 1975, Technical cartographic standards volume: unpublished U.S. Geological
1688 Survey internal standards document.
- 1689 U.S. Geological Survey, 1995a, Cartographic and digital standard for geologic map information: U.S.
1690 Geological Survey Open-File Report 95–525, 257 p.
- 1691 U.S. Geological Survey, 1995b, Digital files of geologic map symbols with cartographic specifications: U.S.
1692 Geological Survey Open-File Report 95–526, 2 disks.
- 1693 U.S. Geological Survey (prepared in cooperation with the Geologic Data Subcommittee of the Federal
1694 Geographic Data Committee), 2000, Public Review Draft – Digital cartographic standard for geologic map
1695 symbolization (PostScript implementation): U.S. Geological Survey Open-File Report 99–430 [available on
1696 World Wide Web at <http://pubs.usgs.gov/of/1999/of99-430/>].
- 1697 U.S. Geological Survey (prepared in cooperation with the Geologic Data Subcommittee of the Federal
1698 Geographic Data Committee), 2006, FGDC Digital cartographic standard for geologic map symbolization
1699 (PostScript implementation): U.S. Geological Survey Techniques and Methods 11–A2 [available on World
1700 Wide Web at <http://pubs.usgs.gov/tm/2005/11A02/>].
- 1701 Weinman, Lynda, 1996, Designing Web graphics: Indianapolis, Ind., New Riders Publishing, p. 49–72.

APPENDIX A. GEOLOGIC MAP SYMBOLS, COLORS, AND PATTERNS

This [normative] appendix contains the geologic map symbols and their descriptions, their cartographic specifications, and notes on their usage. Also included are the CMYK Color Chart and the Pattern Chart (enclosed in sleeve on inside back cover), which contain colors and patterns for use on geologic maps.

CONTENTS OF APPENDIX A

- | | |
|--|---|
| 1. Contacts, Key Beds, and Dikes | 22. Plate-Tectonic Features |
| 2. Faults | 23. Miscellaneous Uplift and Collapse Features |
| 3. Boundaries Located by Geophysical Surveys | 24. Terrestrial Impact Features |
| 4. Lineaments and Joints | 25. Planetary Geology Features |
| 5. Folds | 26. Geohydrologic Features |
| 6. Bedding | 27. Weather Stations |
| 7. Cleavage | 28. Transportation Features |
| 8. Foliation | 29. Boundaries |
| 9. Lineation | 30. Topographic and Hydrographic Features |
| 10. Paleontological Features | 31. Miscellaneous Map Elements |
| 11. Geophysical and Structure Contours | 32. Geologic Age Symbol Font ("FGDC-GeoAge") |
| 12. Fluvial and Alluvial Features | 33. Suggested Ranges of Map-Unit Colors for Volcanic and Plutonic Rocks and for Stratigraphic Ages of Sedimentary and Metamorphic Rocks |
| 13. Glacial and Glaciofluvial Features | 34. State Location Maps |
| 14. Periglacial Features | 35. Bar Scales |
| 15. Lacustrine and Marine Features | 36. Mean Declination Arrows |
| 16. Eolian Features | 37. Lithologic Patterns |
| 17. Landslide and Mass-Wasting Features | 38. Explanation for Pattern Chart |
| 18. Volcanic Features | 39. Explanation for CMYK Color Chart |
| 19. Natural Resources | |
| 20. Hazardous Waste Sites | |
| 21. Neotectonic and Earthquake-Hazard Features | |
-

PREFACE TO APPENDIX A

In this preface to Appendix A, we include some general guidelines for using the "FGDC Digital Cartographic Standard for Geologic Map Symbolization," as well as some basic information on the newly implemented standard for the scientific confidence and the locational accuracy of geologic features. For more specific information, please refer to the following sections in the accompanying introductory text: "Geologic Mapping Concepts and Definitions" (Section 3); "Scientific Confidence and Locational Accuracy of Geologic Features" (Section 4); "Guidelines for Map Color and Pattern Selection" (Section 5); "Guidelines for Map Labeling" (Section 6); and "Technical Specifications Used in the Preparation of this Standard" (Section 7).

ABOUT THIS VERSION OF THE STANDARD

This now formally approved version of the standard incorporates revisions that reflect reviewers' responses to the "Public Review Draft — Digital Cartographic Standard for Geologic Map Symbolization" (Federal Geographic Data Committee, 2000). We thank all the reviewers for their contributions, and we are pleased that most of the comments and suggestions could be accommodated (see http://ngmdb.usgs.gov/fgdc_gds/geolsymstd/prdresponse.html). Note, however, that we were able to fully address suggestions for the inclusion of new symbols only if examples of the proposed symbol additions were provided.

We intend this standard to be a "living standard" — that is, we recognize that an existing symbol's usage may need to be modified, or a new symbol or set of symbols created, to more fully express local geologic conditions or to keep pace with evolving geologic mapping concepts and practices. Accordingly, such new or modified symbols, if found to be of wide applicability, will be incorporated into this standard through planned, periodic revisions. You are invited to submit comments and suggestions for updates or other improvements to this standard by email to mapsymbol@flagmail.wr.usgs.gov.

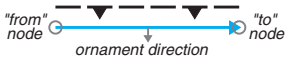
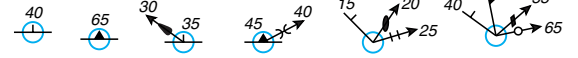
In response to reviewers' comments, we tested various cartographic specifications for dashed and ornamented line symbols in several different software packages (Adobe Illustrator v.8.0.1, ArcInfo v.7x, and ArcGIS v.8x) to ensure that symbols would render correctly and consistently. As a result, we found it necessary to modify the cartographic specifications (dash/gap lengths and ornament spacings) of many line symbols in this standard from the specifications found in previous versions of the standard.

HOW TO USE THIS STANDARD

The contents of this standard are not intended to be used inflexibly or in a manner that will limit one's ability to communicate the observations and interpretations gained from geologic mapping. On the contrary, we recognize that, in certain situations, a symbol or its usage might need to be modified in order to better represent a particular feature on a geologic map or cross section.

To that end, we emphasize that this standard allows the use of any symbol that doesn't conflict with others in the standard, provided that it is clearly explained on the map and in the database. In addition, modifying the size, color, and (or) linewidth of an existing symbol to suit the needs of a particular map or output device also is permitted, provided that the modified symbol's appearance is not too similar to another symbol on the map. Be aware, however, that reducing linewidths below .125 mm (.005 inch) may cause symbols to plot incorrectly if output at higher resolutions (1800 dpi or higher). For more information, please refer to Section 7 ("Technical Specifications Used in the Preparation of this Standard") in the accompanying introductory text.

To facilitate the use of this standard, we include in this preface tables showing conversion values from inches to points to millimeters (table 1), abbreviations used (table 2), and spot color specifications and their equivalent colors in other color models (table 3). We also offer the following illustrations of a few key terms and concepts used when preparing this standard:

LINE SYMBOLS	POINT SYMBOLS	TYPE EXAMPLES	
Right-Hand Rule: 	Point of Observation (at center of cyan circle): 	Sans-Serif Font: T̄v Qls HAYWARD FAULT	Serif Font: Triassic volcanic rocks <i>Columbia River</i>

THE NEWLY IMPLEMENTED STANDARD FOR THE SCIENTIFIC CONFIDENCE AND
LOCATIONAL ACCURACY OF GEOLOGIC MAP FEATURES

In response to reviewers' comments, we have implemented a new standard (concepts and terminology) for the scientific confidence and the locational accuracy of geologic map features (note that, at this time, we have applied these new concepts only to line features). Scientific confidence expresses a geologist's level of certainty about the identity or perhaps even the existence of a feature. Locational accuracy is based on the relation between a feature's location in the field and its position on the base map. For a more detailed discussion of these concepts and their associated terminology, please refer to Section 4, "Scientific Confidence and Locational Accuracy of Geologic Features," in the accompanying introductory text.

FEATURE ATTRIBUTES FOR SCIENTIFIC CONFIDENCE AND LOCATIONAL ACCURACY

The following is a list of the feature attributes (in *italics*) that are used to express these concepts:

Scientific Confidence:

- Identity — '*certain*' or '*questionable*'
- Existence — '*certain*' or '*questionable*'

Locational Accuracy:

- Locatability — '*observable*,' '*inferred*' (between outcrops or beneath rubble or vegetation), or '*concealed*' (beneath overlying map unit, ice, or water)
- Zone of Confidence — [*value, in ground units*]; [*unit of measurement*]
- Positioning Confidence — '*within zone of confidence*' or '*may not be within zone of confidence*'

LEVELS OF SCIENTIFIC CONFIDENCE AND LOCATIONAL ACCURACY

Discrete levels of scientific confidence and locational accuracy have been developed to use as a terminology that can clearly yet concisely communicate the identity, existence, locatability, and positioning of geologic map features. These levels are directly derived from, or are closely associated with, the feature attributes (for more information, see figures 1 and 2 in the accompanying introductory text). The following diagram shows how the various levels of scientific confidence and locational accuracy relate to the feature attributes; it also shows examples (in italics) of geologic situations to which the levels may be applied.

SCIENTIFIC CONFIDENCE		
Feature Attributes for Scientific Confidence		Levels of Scientific Confidence
Identity: • certain • questionable	Existence: • certain • questionable	Identity and existence certain (<i>"I am certain that the planar feature I see in this outcrop is a fault"</i>) Identity or existence questionable (<i>"I can see some kind of planar feature in this outcrop, but I cannot be certain if it is a contact or a fault"</i>)
LOCATIONAL ACCURACY		
Feature Attributes for Locational Accuracy		Levels of Locational Accuracy
Locatability: • observable • inferred • concealed	Zone of Confidence: • [value, in ground units] • [unit of measurement] Positioning Confidence: • within zone of confidence • may not be within zone of confidence	Location accurate (<i>"I can clearly see this contact in outcrop, and I can accurately plot its position on the map"</i>) Location approximate (<i>"I can see this contact in outcrop, but I can't tell exactly where it is located because I am surrounded by trees"</i>) Location inferred (<i>"I can see by the change in debris materials visible around these gopher holes that a contact runs through here, but I can't locate it precisely"</i>) Location concealed (<i>"I can see that a contact is present on both sides of this lake, but I can't tell where it is located beneath the water"</i>)

The levels of scientific confidence and locational accuracy have been used to identify and describe the line symbols in this standard. The following example is extracted from Appendix A (see p. A-1-1).

DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL
Contact—Identity and existence certain, location accurate	—————	Contact—Identity and existence certain, location inferred	- - - - -
Contact—Identity or existence questionable, location accurate	—————?	Contact—Identity or existence questionable, location inferred	- - - - ? - - - -
Contact—Identity and existence certain, location approximate	- - - - -	Contact—Identity and existence certain, location concealed
Contact—Identity or existence questionable, location approximate	- - - - ? - - - -	Contact—Identity or existence questionable, location concealed?.....

In the symbol explanation on a published map, the levels of scientific confidence and locational accuracy also are used to identify and describe the various types and styles of line symbols that appear on the map; however, not every style of a particular line symbol needs to be listed individually in the explanation, as the following two examples show.

—————

Contact—Solid where location is accurate; long-dashed where location is approximate; short-dashed where location is inferred; dotted where location is concealed. Queries added where identity or existence may be questionable

—————

Fault—Solid where location is accurate; long-dashed where location is approximate; short-dashed where location is inferred; dotted where location is concealed. Queries added where identity or existence may be questionable

▼▼

Thrust fault—Solid where location is accurate; long-dashed where location is approximate; short-dashed where location is inferred; dotted where location is concealed. Queries added where identity or existence may be questionable. Sawteeth on upper plate

Folds—Solid where location is accurate; long-dashed where location is approximate; dotted where location is concealed. Queries added where identity or existence may be questionable. Showing direction of plunge where appropriate

Anticline

Syncline

The example on the left shows how the descriptions of all styles of a particular line type are grouped into one explanatory paragraph (if the symbol explanation directly follows the Description of Map Units, a separate title is not added).

The example below shows a more condensed alternative in which the descriptions of all line-symbol styles are summarized in a bracketed headnote (a separate title usually is added).

SYMBOL EXPLANATION

[For all line symbols: lines are solid where location is accurate; long-dashed where location is approximate; short-dashed where location is inferred; dotted where location is concealed. Queries added where identity or existence may be questionable]

—————

Contact

—————

Fault

▼▼

Thrust fault—Sawteeth on upper plate

Folds—Showing direction of plunge where appropriate

Anticline

Syncline

A-iii

Table 1. Chart showing conversion values from inches (in) to points (pts) to millimeters (mm).

in	pts	mm	in	pts	mm	in	pts	mm	in	pts	mm
0.001	0.072	0.025	0.051	3.672	1.295	0.101	7.272	2.565	0.151	10.872	3.835
0.002	0.144	0.051	0.052	3.744	1.321	0.102	7.344	2.591	0.152	10.944	3.861
0.003	0.216	0.076	0.053	3.816	1.346	0.103	7.416	2.616	0.153	11.016	3.886
0.004	0.288	0.102	0.054	3.888	1.372	0.104	7.488	2.642	0.154	11.088	3.912
0.005	0.360	0.127	0.055	3.960	1.397	0.105	7.560	2.667	0.155	11.160	3.937
0.006	0.432	0.152	0.056	4.032	1.422	0.106	7.632	2.692	0.156	11.232	3.962
0.007	0.504	0.178	0.057	4.104	1.448	0.107	7.704	2.718	0.157	11.304	3.988
0.008	0.576	0.203	0.058	4.176	1.473	0.108	7.776	2.743	0.158	11.376	4.013
0.009	0.648	0.229	0.059	4.248	1.499	0.109	7.848	2.769	0.159	11.448	4.039
0.010	0.720	0.254	0.060	4.320	1.524	0.110	7.920	2.794	0.160	11.520	4.064
0.011	0.792	0.279	0.061	4.392	1.549	0.111	7.992	2.819	0.161	11.592	4.089
0.012	0.864	0.305	0.062	4.464	1.575	0.112	8.064	2.845	0.162	11.664	4.115
0.013	0.936	0.330	0.063	4.536	1.600	0.113	8.136	2.870	0.163	11.736	4.140
0.014	1.008	0.356	0.064	4.608	1.626	0.114	8.208	2.896	0.164	11.808	4.166
0.015	1.080	0.381	0.065	4.680	1.651	0.115	8.280	2.921	0.165	11.880	4.191
0.016	1.152	0.406	0.066	4.752	1.676	0.116	8.352	2.946	0.166	11.952	4.216
0.017	1.224	0.432	0.067	4.824	1.702	0.117	8.424	2.972	0.167	12.024	4.242
0.018	1.296	0.457	0.068	4.896	1.727	0.118	8.496	2.997	0.168	12.096	4.267
0.019	1.368	0.483	0.069	4.968	1.753	0.119	8.568	3.023	0.169	12.168	4.293
0.020	1.440	0.508	0.070	5.040	1.778	0.120	8.640	3.048	0.170	12.240	4.318
0.021	1.512	0.533	0.071	5.112	1.803	0.121	8.712	3.073	0.171	12.312	4.343
0.022	1.584	0.559	0.072	5.184	1.829	0.122	8.784	3.099	0.172	12.384	4.369
0.023	1.656	0.584	0.073	5.256	1.854	0.123	8.856	3.124	0.173	12.456	4.394
0.024	1.728	0.610	0.074	5.328	1.880	0.124	8.928	3.150	0.174	12.528	4.420
0.025	1.800	0.635	0.075	5.400	1.905	0.125	9.000	3.175	0.175	12.600	4.445
0.026	1.872	0.660	0.076	5.472	1.930	0.126	9.072	3.200	0.176	12.672	4.470
0.027	1.944	0.686	0.077	5.544	1.956	0.127	9.144	3.226	0.177	12.744	4.496
0.028	2.016	0.711	0.078	5.616	1.981	0.128	9.216	3.251	0.178	12.816	4.521
0.029	2.088	0.737	0.079	5.688	2.007	0.129	9.288	3.277	0.179	12.888	4.547
0.030	2.160	0.762	0.080	5.760	2.032	0.130	9.360	3.302	0.180	12.960	4.572
0.031	2.232	0.787	0.081	5.832	2.057	0.131	9.432	3.327	0.181	13.032	4.597
0.032	2.304	0.813	0.082	5.904	2.083	0.132	9.504	3.353	0.182	13.104	4.623
0.033	2.376	0.838	0.083	5.976	2.108	0.133	9.576	3.378	0.183	13.176	4.648
0.034	2.448	0.864	0.084	6.048	2.134	0.134	9.648	3.404	0.184	13.248	4.674
0.035	2.520	0.889	0.085	6.120	2.159	0.135	9.720	3.429	0.185	13.320	4.699
0.036	2.592	0.914	0.086	6.192	2.184	0.136	9.792	3.454	0.186	13.392	4.724
0.037	2.664	0.940	0.087	6.264	2.210	0.137	9.864	3.480	0.187	13.464	4.750
0.038	2.736	0.965	0.088	6.336	2.235	0.138	9.936	3.505	0.188	13.536	4.775
0.039	2.808	0.991	0.089	6.408	2.261	0.139	10.008	3.531	0.189	13.608	4.801
0.040	2.880	1.016	0.090	6.480	2.286	0.140	10.080	3.556	0.190	13.680	4.826
0.041	2.952	1.041	0.091	6.552	2.311	0.141	10.152	3.581	0.191	13.752	4.851
0.042	3.024	1.067	0.092	6.624	2.337	0.142	10.224	3.607	0.192	13.824	4.877
0.043	3.096	1.092	0.093	6.696	2.362	0.143	10.296	3.632	0.193	13.896	4.902
0.044	3.168	1.118	0.094	6.768	2.388	0.144	10.368	3.658	0.194	13.968	4.928
0.045	3.240	1.143	0.095	6.840	2.413	0.145	10.440	3.683	0.195	14.040	4.953
0.046	3.312	1.168	0.096	6.912	2.438	0.146	10.512	3.708	0.196	14.112	4.978
0.047	3.384	1.194	0.097	6.984	2.464	0.147	10.584	3.734	0.197	14.184	5.004
0.048	3.456	1.219	0.098	7.056	2.489	0.148	10.656	3.759	0.198	14.256	5.029
0.049	3.528	1.245	0.099	7.128	2.515	0.149	10.728	3.785	0.199	14.328	5.055
0.050	3.600	1.270	0.100	7.200	2.540	0.150	10.800	3.810	0.200	14.400	5.080

Table 2. Abbreviations used in this standard.

Abbreviation	Meaning	Example of usage
B	brown [ink]	422-B (pattern)
C	cyan [ink]	132-C (pattern)
CMYK	cyan/magenta/yellow/black	CMYK color model
DO	dropout [pattern]	204-DO (pattern)
FG-8	FGDC-GeoAge [font], 8 pt type	Tg (unit label containing geologic age character)
H-8 ¹	Helvetica [font], 8 pt type	GOLDEN FAULT (name of fault)
HB-8 ¹	Helvetica Bold [font], 8 pt type	? (query indicating "identity or existence questionable" fault)
HI-6 ¹	Helvetica Italic [font], 6 pt type	40 (dip value)
HSV	hue/saturation/value	HSV color model
K	black [ink]	134-K (pattern)
M	magenta [ink]	313-M (pattern)
R	red [ink]	405-R (pattern)
RGB	red/green/blue	RGB color model
TBI-12 ²	Times Bold Italic [font], 12 pt type	A—A' (cross section labels)
TI-8 ²	Times Italic [font], 8 pt type	Bass Lake (name of lake)
Y	yellow [ink]	CMYK color model

¹ Although Helvetica has been specified, any sans-serif font (such as Univers or Arial) may be used. Note, however, that if other fonts are used, their appearance will not match that of FGDC-GeoAge, whose character size and spacing is based on Helvetica.

² Although Times has been specified, any serif font (such as Times New Roman or Souvenir) may be used.

Table 3. Spot color specifications used in this standard, and their equivalent colors in other color models.

[Abbreviations: C, cyan; M, magenta; Y, yellow; K, black (standard process-color inks combined during offset printing). CMYK, cyan/magenta/yellow/black color model. R, red; G, green; B, blue (primary colors transmitted by computer monitors and televisions). RGB, red/green/blue color model.]

Spot color ¹	Pantone color ²	Directly converted CMYK color ³	Color on CMYK Color Chart ⁴	Directly converted RGB color ⁵	"Web-safe" RGB color ⁶
red	485 U	0/100/91/0	0/100/100	254/0/12	255/0/0
50% red	485 U (screened 50%)	0/50/45.5/0	0/50/40	251/128/104	255/102/102
green	354 U	91/0/83/0	100/0/100	24/150/76	51/153/102
50% green	354 U (screened 50%)	45.5/0/41.5/0	40/0/40	139/207/144	153/204/153
violet	253 U	47/91/0/0	50/100/0	136/22/135	153/0/153
purple	2735 U	100/94/0/0	100/100/0	18/12/128	0/0/153
brown	470 U	0/56/94/34	30/70/100	168/74/9	153/51/0
orange	1585 U	0/56/87/0	0/60/100	254/112/24	255/102/0

¹ Generic name of spot color, as specified in this standard (note that cyan, magenta, yellow, and black are process-color inks, not spot colors, and so they have not been included in this table).

² Suggested Pantone color for offset printing on uncoated paper.

³ Color value after direct conversion of suggested Pantone color to CMYK (C/M/Y/K) by Adobe Illustrator 8.0.1.

⁴ Closest color on CMYK Color Chart (in pocket) to directly converted CMYK color value.

⁵ Color value after direct conversion of suggested Pantone color to RGB (R/G/B) by Adobe Illustrator 8.0.1.

⁶ Closest "web-safe" color (see discussion in Section 7.3, entitled "Color Specifications for Line and Point Symbols," in the introductory text) to directly converted RGB color value.

1—CONTACTS, KEY BEDS, AND DIKS

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
1.1—Contacts				
1.1.1	Contact—Identity and existence certain, location accurate	—————	lineweight .15 mm	
1.1.2	Contact—Identity or existence questionable, location accurate	—————?		
1.1.3	Contact—Identity and existence certain, location approximate	— — — — —		
1.1.4	Contact—Identity or existence questionable, location approximate	— — — — —?		
1.1.5	Contact—Identity and existence certain, location inferred	- - - - -		
1.1.6	Contact—Identity or existence questionable, location inferred	- - - - -?		
1.1.7	Contact—Identity and existence certain, location concealed	- - - - -		
1.1.8	Contact—Identity or existence questionable, location concealed	- - - - -?		
1.1.9	Internal contact—Identity and existence certain, location accurate	—————		Use to delineate individual debris flows, landslide blocks, alluvial fans, etc., within the same geologic map unit.
1.1.10	Internal contact—Identity or existence questionable, location accurate	—————?		
1.1.11	Internal contact—Identity and existence certain, location approximate	— — — — —		
1.1.12	Internal contact—Identity or existence questionable, location approximate	— — — — —?		
1.1.13	Internal contact—Identity and existence certain, location inferred	- - - - -		
1.1.14	Internal contact—Identity or existence questionable, location inferred	- - - - -?		
1.1.15	Internal contact—Identity and existence certain, location concealed	- - - - -		
1.1.16	Internal contact—Identity or existence questionable, location concealed	- - - - -?		
1.1.17	Gradational contact—Identity and existence certain, location accurate			Use to indicate a gradual or continuous lithologic change from one geologic map unit to another.
1.1.18	Gradational contact—Identity or existence questionable, location accurate	?		
1.1.19	Gradational contact—Identity and existence certain, location approximate			
1.1.20	Gradational contact—Identity or existence questionable, location approximate	?		
1.1.21	Gradational contact—Identity and existence certain, location inferred	- - - - -		
1.1.22	Gradational contact—Identity or existence questionable, location inferred	- - - - -?		
1.1.23	Gradational contact—Identity and existence certain, location concealed	- - - - -		
1.1.24	Gradational contact—Identity or existence questionable, location concealed	- - - - -?		

1—CONTACTS, KEY BEDS, AND DIKES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
1.1 — Contacts (continued)				
1.1.25	Unconformable contact—Identity and existence certain, location accurate			May be used to show paraconformities or disconformities. Not intended for use to show angular unconformities or nonconformities.
1.1.26	Unconformable contact—Identity or existence questionable, location accurate			
1.1.27	Unconformable contact—Identity and existence certain, location approximate			Boundary of geologic map unit is center line (solid or dashed), not "sine-wave"-style line.
1.1.28	Unconformable contact—Identity or existence questionable, location approximate			
1.1.29	Unconformable contact—Identity and existence certain, location inferred			
1.1.30	Unconformable contact—Identity or existence questionable, location inferred			
1.1.31	Unconformable contact—Identity and existence certain, location concealed			
1.1.32	Unconformable contact—Identity or existence questionable, location concealed			
1.1.33	Incised-scarp sedimentary contact—Identity and existence certain, location accurate. Hachures point downscarp			Use to show where a younger surficial geologic unit has been deposited on an erosional scarp that has been incised into an older surficial geologic unit.
1.1.34	Incised-scarp sedimentary contact—Identity or existence questionable, location accurate. Hachures point downscarp			
1.1.35	Incised-scarp sedimentary contact—Identity and existence certain, location approximate. Hachures point downscarp			
1.1.36	Incised-scarp sedimentary contact—Identity or existence questionable, location approximate. Hachures point downscarp			

*For more information, see general guidelines on pages A-i to A-v.

1—CONTACTS, KEY BEDS, AND DIKES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
1.2—Key beds				
1.2.1	Key bed—Identity and existence certain, location accurate		<i>lineweight .2 mm</i> 	Use to show key beds that are too narrow to map as an area at map scale. Add name of geologic map unit if more than one type of key bed is shown on map (see Section 1.4). May also be shown in color.
1.2.2	Key bed—Identity or existence questionable, location accurate			
1.2.3	Key bed—Identity and existence certain, location approximate			
1.2.4	Key bed—Identity or existence questionable, location approximate			
1.2.5	Key bed—Identity and existence certain, location inferred			
1.2.6	Key bed—Identity or existence questionable, location inferred			
1.2.7	Key bed—Identity and existence certain, location concealed			
1.2.8	Key bed—Identity or existence questionable, location concealed			
1.2.9	Clay bed—Identity and existence certain, location accurate		<i>lineweight .3 mm</i> <i>color 100% green</i> 	Use to show clay beds that are too narrow to map as an area at map scale. Add name if more than one type is shown on map (see Section 1.4). May also be shown in black or other colors.
1.2.10	Clay bed—Identity or existence questionable, location accurate			
1.2.11	Clay bed—Identity and existence certain, location approximate			
1.2.12	Clay bed—Identity or existence questionable, location approximate			
1.2.13	Clay bed—Identity and existence certain, location inferred			
1.2.14	Clay bed—Identity or existence questionable, location inferred			
1.2.15	Clay bed—Identity and existence certain, location concealed			
1.2.16	Clay bed—Identity or existence questionable, location concealed			
1.2.17	Bed of economically important commodity—Identity and existence certain, location accurate		<i>lineweight .3 mm</i> 	Use to show such economically important beds as gypsum, salt, bentonite, phosphate, or limestone that are too narrow to map as an area at map scale. Do not use to show coal beds (see Section 1.2, ref. nos. 1.2.25-40). Add name of commodity if more than one type is shown on map (see Section 1.4). May also be shown in color.
1.2.18	Bed of economically important commodity—Identity or existence questionable, location accurate			
1.2.19	Bed of economically important commodity—Identity and existence certain, location approximate			
1.2.20	Bed of economically important commodity—Identity or existence questionable, location approximate			
1.2.21	Bed of economically important commodity—Identity and existence certain, location inferred			
1.2.22	Bed of economically important commodity—Identity or existence questionable, location inferred			
1.2.23	Bed of economically important commodity—Identity and existence certain, location concealed			
1.2.24	Bed of economically important commodity—Identity or existence questionable, location concealed			

1—CONTACTS, KEY BEDS, AND DIKES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
1.2—Key beds (continued)				
1.2.25	Coal bed—Identity and existence certain, location accurate		lineweight .3 mm color 100% red HB-8 (100% red)	Use to show coal beds that are too narrow to map as an area at map scale. Add name if more than one type is shown on map (see Section 1.4). May also be shown in black or other colors.
1.2.26	Coal bed—Identity or existence questionable, location accurate			
1.2.27	Coal bed—Identity and existence certain, location approximate			
1.2.28	Coal bed—Identity or existence questionable, location approximate			
1.2.29	Coal bed—Identity and existence certain, location inferred			
1.2.30	Coal bed—Identity or existence questionable, location inferred			
1.2.31	Coal bed—Identity and existence certain, location concealed			
1.2.32	Coal bed—Identity or existence questionable, location concealed			Use to show clinkered coal beds that are too narrow to map as an area at map scale. Tops of V's follow trace of bed; V's point downward stratigraphically. Add name if more than one type is shown on map (see Section 1.4). May also be shown in black or other colors.
1.2.33	Clinkered coal bed—Identity and existence certain, location accurate			
1.2.34	Clinkered coal bed—Identity or existence questionable, location accurate			
1.2.35	Clinkered coal bed—Identity and existence certain, location approximate			
1.2.36	Clinkered coal bed—Identity or existence questionable, location approximate			
1.2.37	Clinkered coal bed—Identity and existence certain, location inferred			
1.2.38	Clinkered coal bed—Identity or existence questionable, location inferred			
1.2.39	Clinkered coal bed—Identity and existence certain, location concealed			Add name if more than one type is shown on map (see Section 1.4).
1.2.40	Clinkered coal bed—Identity or existence questionable, location concealed			
1.2.41	Area of clinkered coal bed			Outcrop areas may either overprint other geologic map units or be used as stand-alone geologic map units. Each type of outcrop area may also be shown in other values of black or in other colors; add name(s) if more than one type is shown on map (see Section 1.4).
1.2.42	Outcrop area of key bed or bed of economically important commodity (1st option)			
1.2.43	Outcrop area of key bed or bed of economically important commodity (2nd option)			
1.2.44	Outcrop area of clay bed			
1.2.45	Outcrop area of coal bed			

*For more information, see general guidelines on pages A-1 to A-9.

1—CONTACTS, KEY BEDS, AND DIKES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
1.3—Dikes				
1.3.1	Dike (1st option)—Identity and existence certain, location accurate		color 100% red lineweight .25 mm	Use when dike is too narrow to show as an area at map scale. Add map-unit labels to dikes if needed (see Section 1.4); use a queried label if identity of dike is questionable. May also be shown in black or other colors.
1.3.2	Dike (1st option)—Identity and existence certain, location approximate		3.5 mm lineweight .75 mm	
1.3.3	Dike (2nd option)—Identity and existence certain, location accurate		color 100% red lineweight .25 mm 2.0 mm 1.25 mm	
1.3.4	Dike (2nd option)—Identity and existence certain, location approximate		3.5 mm lineweight .75 mm	
1.3.5	Dike (3rd option)—Identity and existence certain, location accurate		color 100% red lineweight .25 mm 90° 4.25 mm 1.0 mm	
1.3.6	Dike (3rd option)—Identity and existence certain, location approximate		3.5 mm lineweight .75 mm	
1.3.7	Dike (4th option)—Identity and existence certain, location accurate		color 100% red lineweight .25 mm dot diameter 1.125 mm 4.25 mm	
1.3.8	Dike (4th option)—Identity and existence certain, location approximate		3.5 mm lineweight .75 mm	
1.3.9	Dike (5th option)—Identity and existence certain, location accurate		color 100% red lineweight .25 mm circle diameter 1.175 mm 4.25 mm	
1.3.10	Dike (5th option)—Identity and existence certain, location approximate		3.5 mm lineweight .75 mm	
1.3.11	Dike (6th option)—Identity and existence certain, location accurate		color 100% red lineweight .25 mm 1.125 mm 4.25 mm	
1.3.12	Dike (6th option)—Identity and existence certain, location approximate		3.5 mm lineweight .75 mm	
1.3.13	Dike of variable thickness		50% red contact [lineweight .15 mm]	
1.3.14	Dike intruding fault (1st option)		fault [lineweight .375 mm]	
1.3.15	Dike intruding fault (2nd option)		contact [lineweight .15 mm]	

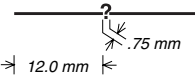
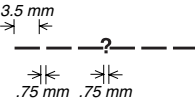
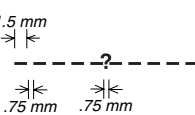
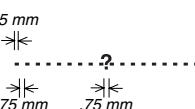
*For more information, see general guidelines on pages A-i to A-v.

1—CONTACTS, KEY BEDS, AND DIKES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
1.4—Line-symbol decorations and notations for contacts, key beds, and dikes				
1.4.1	Inclined contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity (1st option)—Showing dip value and direction		tick length 1.75 mm; lineweight .15 mm 35 ← H-6	Line-symbol decorations may be added to any type or style of contact, as well as to any type or style of key bed or dike (use proper line-weights, etc., to show clay beds, coal beds, dikes, etc.). Place tick, arrow, or other line-symbol decoration where observation was made. Add arrowhead or '90' to ticks showing dip if necessary for clarity.
1.4.2	Inclined contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity (2nd option)—Showing dip value and direction		tick length 1.375 mm; lineweight .15 mm 15 ← H-6 30°	
1.4.3	Vertical or near-vertical contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity (1st option)		tick length 2.5 mm; lineweight .15 mm	
1.4.4	Vertical or near-vertical contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity (2nd option)		90 ← H-6	
1.4.5	Overtaken contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity (1st option)—Showing dip value and direction		tick length 1.75 mm; lineweight .15 mm 85 ← H-6 .625 mm radius	
1.4.6	Overtaken contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity (2nd option)—Showing dip value and direction		tick length 1.375 mm; lineweight .15 mm 75 ← H-6 .625 mm radius 30°	
1.4.7	Lineation on surface of contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity—Showing bearing and plunge		6.0 mm 65 ← H-6 lineweight .175 mm 25°	
1.4.8	Lineation on surface of inclined contact, dike, key bed, clay bed, coal bed, or bed of economically important commodity—Tick shows contact dip value and direction; arrow shows bearing and plunge of lineation		tick length 1.75 mm; lineweight .15 mm H-6 → 25 35	
1.4.9	Contact—Showing relative age of intrusive or extrusive units where known: Y, younger; O, older		H-7 → Y H-7 → O	
1.4.10	Contact—Showing location where contact is particularly well exposed in field		1/20° 1.75 mm .75 mm	
1.4.11	Key bed, clay bed, coal bed, bed of economically important commodity, or dike—Showing thickness and location where measured		1.5 ← H-6	Use proper line-weights, etc., to show clay beds, coal beds, dikes, etc.
1.4.12	Key bed—Showing name		ds ← H-8	
1.4.13	Clay bed—Showing name		sc ← H-8 (100% black)	
1.4.14	Bed of economically important commodity—Showing name		gyp ← H-8	
1.4.15	Coal bed—Showing name		lg ← H-8 (100% black)	
1.4.16	Clinkered coal bed—Showing name		m ← H-8 (100% black)	
1.4.17	Area of clinkered coal bed—Showing name		bg ← H-8 (100% black)	Although only "dike (2nd option)" is shown labeled here, map-unit labels may be added to any type of dike symbol. Use a queried map-unit label if identity of dike is questionable.
1.4.18	Dike—Showing name		Km ← H-8 leader lineweight .175 mm	
1.4.19	Dike of variable thickness—Showing name		KJd ← H-8 leader lineweight .175 mm	
1.4.20	Dike intruding fault (1st option)—Showing name		Km ← H-8 leader lineweight .175 mm	
1.4.21	Dike intruding fault (2nd option)—Showing name		H-8 → Td leader lineweight .175 mm	

*For more information, see general guidelines on pages A-i to A-v.

2—FAULTS

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.1—Faults (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)				
2.1.1	Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip) —Identity and existence certain, location accurate	—————	<i>lineweight .375 mm</i> 	Use generic, nonspecific (non-ornamented) fault symbols when orientation or sense of slip is not known or not specified; use also on small-scale maps to show regional fault patterns. If orientation or sense of slip is known and if scale allows, use more specific types of ornamented fault symbols to indicate fault geometry and (or) relative motion.
2.1.2	Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip) —Identity or existence questionable, location accurate	—————?		
2.1.3	Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip) —Identity and existence certain, location approximate	-----		
2.1.4	Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip) —Identity or existence questionable, location approximate	-----?		
2.1.5	Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip) —Identity and existence certain, location inferred	-----		
2.1.6	Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip) —Identity or existence questionable, location inferred	-----?		
2.1.7	Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip) —Identity and existence certain, location concealed		
2.1.8	Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip) —Identity or existence questionable, location concealed?		

*For more information, see general guidelines on pages A-i to A-v.

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*	
2.2—Normal faults					
2.2.1	Normal fault—Identity and existence certain, location accurate. Ball and bar on downthrown block			Ball and bar symbols are placed along a fault to indicate its overall fault type (normal fault). Ball and bar symbols may also be placed along other types of faults at specific localities where observations of normal (or apparent normal) offset have been made (see Section 2.11).	
2.2.2	Normal fault—Identity or existence questionable, location accurate. Ball and bar on downthrown block				
2.2.3	Normal fault—Identity and existence certain, location approximate. Ball and bar on downthrown block				
2.2.4	Normal fault—Identity or existence questionable, location approximate. Ball and bar on downthrown block				
2.2.5	Normal fault—Identity and existence certain, location inferred. Ball and bar on downthrown block			Ball and bar symbols may be combined with paired arrows to show oblique offset (see Sections 2.7, 2.11). In cross section, use paired arrows to show relative motion of normal faults (see Section 2.11).	
2.2.6	Normal fault—Identity or existence questionable, location inferred. Ball and bar on downthrown block				
2.2.7	Normal fault—Identity and existence certain, location concealed. Ball and bar on downthrown block				
2.2.8	Normal fault—Identity or existence questionable, location concealed. Ball and bar on downthrown block				
2.2.9	Low-angle normal fault—Identity and existence certain, location accurate. Half-circles on downthrown block			Half-circles indicate overall fault type (low-angle normal fault); they are not placed at specific localities where observations have been made.	
2.2.10	Low-angle normal fault—Identity or existence questionable, location accurate. Half-circles on downthrown block				
2.2.11	Low-angle normal fault—Identity and existence certain, location approximate. Half-circles on downthrown block				In cross section, use paired arrows to show relative motion of low-angle normal faults (see Section 2.11).
2.2.12	Low-angle normal fault—Identity or existence questionable, location approximate. Half-circles on downthrown block				
2.2.13	Low-angle normal fault—Identity and existence certain, location inferred. Half-circles on downthrown block				
2.2.14	Low-angle normal fault—Identity or existence questionable, location inferred. Half-circles on downthrown block				
2.2.15	Low-angle normal fault—Identity and existence certain, location concealed. Half-circles on downthrown block				
2.2.16	Low-angle normal fault—Identity or existence questionable, location concealed. Half-circles on downthrown block				

*For more information, see general guidelines on pages A-i to A-v.

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.3—Low-angle faults (unknown or unspecified sense of slip)				
2.3.1	Low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location accurate. Half-circles on upper plate			Use to show faults that exhibit low-angle geometry but for which relative motion cannot be (or has not been) specified. Half-circles indicate overall fault type (low-angle fault, unknown or unspecified sense of slip); they are not placed at specific localities where observations have been made.
2.3.2	Low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable, location accurate. Half-circles on upper plate			
2.3.3	Low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location approximate. Half-circles on upper plate			
2.3.4	Low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable, location approximate. Half-circles on upper plate			
2.3.5	Low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location inferred. Half-circles on upper plate			
2.3.6	Low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable, location inferred. Half-circles on upper plate			
2.3.7	Low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location concealed. Half-circles on upper plate			
2.3.8	Low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable, location concealed. Half-circles on upper plate			
2.4—Reverse faults				
2.4.1	Reverse fault—Identity and existence certain, location accurate. Rectangles on upthrown block			Rectangles indicate overall fault type (reverse fault); they are not placed at specific localities where observations have been made. In cross section, use paired arrows to show relative motion of reverse faults (see Section 2.11).
2.4.2	Reverse fault—Identity or existence questionable, location accurate. Rectangles on upthrown block			
2.4.3	Reverse fault—Identity and existence certain, location approximate. Rectangles on upthrown block			
2.4.4	Reverse fault—Identity or existence questionable, location approximate. Rectangles on upthrown block			
2.4.5	Reverse fault—Identity and existence certain, location inferred. Rectangles on upthrown block			
2.4.6	Reverse fault—Identity or existence questionable, location inferred. Rectangles on upthrown block			
2.4.7	Reverse fault—Identity and existence certain, location concealed. Rectangles on upthrown block			
2.4.8	Reverse fault—Identity or existence questionable, location concealed. Rectangles on upthrown block			

*For more information, see general guidelines on pages A-i to A-v.

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.5—Rotational or scissor faults				
2.5.1	Rotational or scissor fault, reverse-slip offset— Identity and existence certain, location accurate. Rectangles on upthrown block			<p>Rectangles indicate overall fault type (rotational or scissor fault, reverse-slip offset); they are not placed at specific localities where observations have been made.</p> <p>In cross section, use paired arrows to show relative motion of rotational or scissor faults (see Section 2.11).</p>
2.5.2	Rotational or scissor fault, reverse-slip offset— Identity or existence questionable, location accurate. Rectangles on upthrown block			
2.5.3	Rotational or scissor fault, reverse-slip offset— Identity and existence certain, location approximate. Rectangles on upthrown block			
2.5.4	Rotational or scissor fault, reverse-slip offset— Identity or existence questionable, location approximate. Rectangles on upthrown block			
2.5.5	Rotational or scissor fault, reverse-slip offset— Identity and existence certain, location inferred. Rectangles on upthrown block			
2.5.6	Rotational or scissor fault, reverse-slip offset— Identity or existence questionable, location inferred. Rectangles on upthrown block			
2.5.7	Rotational or scissor fault, reverse-slip offset— Identity and existence certain, location concealed. Rectangles on upthrown block			
2.5.8	Rotational or scissor fault, reverse-slip offset— Identity or existence questionable, location concealed. Rectangles on upthrown block			
2.5.9	Rotational or scissor fault, normal-slip offset— Identity and existence certain, location accurate. Rectangles on downthrown block			<p>Rectangles indicate overall fault type (rotational or scissor fault, normal-slip offset); they are not placed at specific localities where observations have been made.</p> <p>In cross section, use paired arrows to show relative motion of rotational or scissor faults (see Section 2.11).</p>
2.5.10	Rotational or scissor fault, normal-slip offset— Identity or existence questionable, location accurate. Rectangles on downthrown block			
2.5.11	Rotational or scissor fault, normal-slip offset— Identity and existence certain, location approximate. Rectangles on downthrown block			
2.5.12	Rotational or scissor fault, normal-slip offset— Identity or existence questionable, location approximate. Rectangles on downthrown block			
2.5.13	Rotational or scissor fault, normal-slip offset— Identity and existence certain, location inferred. Rectangles on downthrown block			
2.5.14	Rotational or scissor fault, normal-slip offset— Identity or existence questionable, location inferred. Rectangles on downthrown block			
2.5.15	Rotational or scissor fault, normal-slip offset— Identity and existence certain, location concealed. Rectangles on downthrown block			
2.5.16	Rotational or scissor fault, normal-slip offset— Identity or existence questionable, location concealed. Rectangles on downthrown block			

*For more information, see general guidelines on pages A-i to A-v.

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.6—Strike-slip faults				
2.6.1	Strike-slip fault, right-lateral offset—Identity and existence certain, location accurate. Arrows show relative motion			<p>Paired arrows are placed along a fault to indicate its overall type (strike-slip fault) and its relative motion.</p> <p>Paired arrows may also be placed along other types of faults at specific localities where observations of strike-slip (or apparent strike-slip) offset have been made (see Section 2.11).</p>
2.6.2	Strike-slip fault, right-lateral offset—Identity or existence questionable, location accurate. Arrows show relative motion			
2.6.3	Strike-slip fault, right-lateral offset—Identity and existence certain, location approximate. Arrows show relative motion			<p>Paired arrows may be combined with ball and bar symbols to show oblique offset (see Sections 2.7, 2.11).</p> <p>In cross section, use either A/T or +/- notation to show relative motion of strike-slip faults (see Section 2.11).</p>
2.6.4	Strike-slip fault, right-lateral offset—Identity or existence questionable, location approximate. Arrows show relative motion			
2.6.5	Strike-slip fault, right-lateral offset—Identity and existence certain, location inferred. Arrows show relative motion			
2.6.6	Strike-slip fault, right-lateral offset—Identity or existence questionable, location inferred. Arrows show relative motion			
2.6.7	Strike-slip fault, right-lateral offset—Identity and existence certain, location concealed. Arrows show relative motion			
2.6.8	Strike-slip fault, right-lateral offset—Identity or existence questionable, location concealed. Arrows show relative motion			
2.6.9	Strike-slip fault, left-lateral offset—Identity and existence certain, location accurate. Arrows show relative motion			
2.6.10	Strike-slip fault, left-lateral offset—Identity or existence questionable, location accurate. Arrows show relative motion			
2.6.11	Strike-slip fault, left-lateral offset—Identity and existence certain, location approximate. Arrows show relative motion			
2.6.12	Strike-slip fault, left-lateral offset—Identity or existence questionable, location approximate. Arrows show relative motion			
2.6.13	Strike-slip fault, left-lateral offset—Identity and existence certain, location inferred. Arrows show relative motion			
2.6.14	Strike-slip fault, left-lateral offset—Identity or existence questionable, location inferred. Arrows show relative motion			
2.6.15	Strike-slip fault, left-lateral offset—Identity and existence certain, location concealed. Arrows show relative motion			
2.6.16	Strike-slip fault, left-lateral offset—Identity or existence questionable, location concealed. Arrows show relative motion			

*For more information, see general guidelines on pages A-i to A-v.

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.7—Oblique-slip faults				
2.7.1	Oblique-slip fault, right-lateral offset—Identity and existence certain, location accurate. Arrows show relative motion; ball and bar on downthrown block			Sets of paired arrows and ball and bar symbols are placed along a fault to indicate its overall type (oblique-slip fault) and its relative motion.
2.7.2	Oblique-slip fault, right-lateral offset—Identity or existence questionable, location accurate. Arrows show relative motion; ball and bar on downthrown block			
2.7.3	Oblique-slip fault, right-lateral offset—Identity and existence certain, location approximate. Arrows show relative motion; ball and bar on downthrown block			Sets of paired arrows and ball and bar symbols may also be placed along other types of faults at specific localities where observations of oblique-slip (or apparent oblique-slip) offset have been made (see Section 2.11).
2.7.4	Oblique-slip fault, right-lateral offset—Identity or existence questionable, location approximate. Arrows show relative motion; ball and bar on downthrown block			
2.7.5	Oblique-slip fault, right-lateral offset—Identity and existence certain, location inferred. Arrows show relative motion; ball and bar on downthrown block			In cross section, use paired arrows with either A/T or +/- notation to show relative motion of oblique-slip faults (see Section 2.11).
2.7.6	Oblique-slip fault, right-lateral offset—Identity or existence questionable, location inferred. Arrows show relative motion; ball and bar on downthrown block			
2.7.7	Oblique-slip fault, right-lateral offset—Identity and existence certain, location concealed. Arrows show relative motion; ball and bar on downthrown block			
2.7.8	Oblique-slip fault, right-lateral offset—Identity or existence questionable, location concealed. Arrows show relative motion; ball and bar on downthrown block			
2.7.9	Oblique-slip fault, left-lateral offset—Identity and existence certain, location accurate. Arrows show relative motion; ball and bar on downthrown block			
2.7.10	Oblique-slip fault, left-lateral offset—Identity or existence questionable, location accurate. Arrows show relative motion; ball and bar on downthrown block			
2.7.11	Oblique-slip fault, left-lateral offset—Identity and existence certain, location approximate. Arrows show relative motion; ball and bar on downthrown block			
2.7.12	Oblique-slip fault, left-lateral offset—Identity or existence questionable, location approximate. Arrows show relative motion; ball and bar on downthrown block			
2.7.13	Oblique-slip fault, left-lateral offset—Identity and existence certain, location inferred. Arrows show relative motion; ball and bar on downthrown block			
2.7.14	Oblique-slip fault, left-lateral offset—Identity or existence questionable, location inferred. Arrows show relative motion; ball and bar on downthrown block			
2.7.15	Oblique-slip fault, left-lateral offset—Identity and existence certain, location concealed. Arrows show relative motion; ball and bar on downthrown block			
2.7.16	Oblique-slip fault, left-lateral offset—Identity or existence questionable, location concealed. Arrows show relative motion; ball and bar on downthrown block			

*For more information, see general guidelines on pages A-i to A-v.

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.8—Thrust faults				
2.8.1	Thrust fault (1st option)—Identity and existence certain, location accurate. Sawteeth on upper (tectonically higher) plate			<p>Sawteeth indicate over-all fault type (thrust fault); they are not placed at specific localities where observations have been made.</p> <p>In cross section, use paired arrows to show relative motion of thrust faults (see Section 2.11).</p> <p>If desired, "2nd option" and "3rd option" symbols may be used to show other types or generations of thrust faults.</p>
2.8.2	Thrust fault (1st option)—Identity or existence questionable, location accurate. Sawteeth on upper (tectonically higher) plate			
2.8.3	Thrust fault (1st option)—Identity and existence certain, location approximate. Sawteeth on upper (tectonically higher) plate			
2.8.4	Thrust fault (1st option)—Identity or existence questionable, location approximate. Sawteeth on upper (tectonically higher) plate			
2.8.5	Thrust fault (1st option)—Identity and existence certain, location inferred. Sawteeth on upper (tectonically higher) plate			
2.8.6	Thrust fault (1st option)—Identity or existence questionable, location inferred. Sawteeth on upper (tectonically higher) plate			
2.8.7	Thrust fault (1st option)—Identity and existence certain, location concealed. Sawteeth on upper (tectonically higher) plate			
2.8.8	Thrust fault (1st option)—Identity or existence questionable, location concealed. Sawteeth on upper (tectonically higher) plate			
2.8.9	Thrust fault (2nd option)—Identity and existence certain, location accurate. Sawteeth on upper (tectonically higher) plate			
2.8.10	Thrust fault (2nd option)—Identity or existence questionable, location accurate. Sawteeth on upper (tectonically higher) plate			
2.8.11	Thrust fault (2nd option)—Identity and existence certain, location approximate. Sawteeth on upper (tectonically higher) plate			
2.8.12	Thrust fault (2nd option)—Identity or existence questionable, location approximate. Sawteeth on upper (tectonically higher) plate			
2.8.13	Thrust fault (2nd option)—Identity and existence certain, location inferred. Sawteeth on upper (tectonically higher) plate			
2.8.14	Thrust fault (2nd option)—Identity or existence questionable, location inferred. Sawteeth on upper (tectonically higher) plate			
2.8.15	Thrust fault (2nd option)—Identity and existence certain, location concealed. Sawteeth on upper (tectonically higher) plate			
2.8.16	Thrust fault (2nd option)—Identity or existence questionable, location concealed. Sawteeth on upper (tectonically higher) plate			
2.8.17	Thrust fault (3rd option)—Identity and existence certain, location accurate. Sawteeth on upper (tectonically higher) plate			
2.8.18	Thrust fault (3rd option)—Identity or existence questionable, location accurate. Sawteeth on upper (tectonically higher) plate			
2.8.19	Thrust fault (3rd option)—Identity and existence certain, location approximate. Sawteeth on upper (tectonically higher) plate			
2.8.20	Thrust fault (3rd option)—Identity or existence questionable, location approximate. Sawteeth on upper (tectonically higher) plate			
2.8.21	Thrust fault (3rd option)—Identity and existence certain, location inferred. Sawteeth on upper (tectonically higher) plate			
2.8.22	Thrust fault (3rd option)—Identity or existence questionable, location inferred. Sawteeth on upper (tectonically higher) plate			
2.8.23	Thrust fault (3rd option)—Identity and existence certain, location concealed. Sawteeth on upper (tectonically higher) plate			
2.8.24	Thrust fault (3rd option)—Identity or existence questionable, location concealed. Sawteeth on upper (tectonically higher) plate			

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.9—Overturned thrust faults				
2.9.1	Overturned thrust fault (1st option)—Identity and existence certain, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			Bars and sawteeth indicate overall fault type (overturned thrust fault); they are not placed at specific localities where observations have been made.
2.9.2	Overturned thrust fault (1st option)—Identity or existence questionable, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.3	Overturned thrust fault (1st option)—Identity and existence certain, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.4	Overturned thrust fault (1st option)—Identity or existence questionable, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.5	Overturned thrust fault (1st option)—Identity and existence certain, location inferred. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.6	Overturned thrust fault (1st option)—Identity or existence questionable, location inferred. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.7	Overturned thrust fault (1st option)—Identity and existence certain, location concealed. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			In cross section, use paired arrows to show relative motion of overturned thrust faults (see Section 2.11). If desired, "2nd option" and "3rd option" symbols may be used to show other types or generations of overturned thrust faults.
2.9.8	Overturned thrust fault (1st option)—Identity or existence questionable, location concealed. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.9	Overturned thrust fault (2nd option)—Identity and existence certain, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.10	Overturned thrust fault (2nd option)—Identity or existence questionable, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.11	Overturned thrust fault (2nd option)—Identity and existence certain, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.12	Overturned thrust fault (2nd option)—Identity or existence questionable, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.13	Overturned thrust fault (2nd option)—Identity and existence certain, location inferred. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.14	Overturned thrust fault (2nd option)—Identity or existence questionable, location inferred. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.15	Overturned thrust fault (2nd option)—Identity and existence certain, location concealed. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.16	Overturned thrust fault (2nd option)—Identity or existence questionable, location concealed. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.17	Overturned thrust fault (3rd option)—Identity and existence certain, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.18	Overturned thrust fault (3rd option)—Identity or existence questionable, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.19	Overturned thrust fault (3rd option)—Identity and existence certain, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.20	Overturned thrust fault (3rd option)—Identity or existence questionable, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.21	Overturned thrust fault (3rd option)—Identity and existence certain, location inferred. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.22	Overturned thrust fault (3rd option)—Identity or existence questionable, location inferred. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.23	Overturned thrust fault (3rd option)—Identity and existence certain, location concealed. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			
2.9.24	Overturned thrust fault (3rd option)—Identity or existence questionable, location concealed. Bars on tectonically higher plate (footwall); sawteeth in direction of dip			

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.10—Detachment faults (sense of slip unspecified)				
2.10.1	Detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location accurate. Hachures on upper plate			May be used to show either normal (extensional) or thrust (compressional) offset. Hachures indicate overall fault type (detachment fault); they are not placed at specific localities where observations have been made.
2.10.2	Detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable, location accurate. Hachures on upper plate			
2.10.3	Detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location approximate. Hachures on upper plate			In cross section, use paired arrows to show relative motion of detachment faults (see Section 2.11).
2.10.4	Detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable, location approximate. Hachures on upper plate			
2.10.5	Detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location inferred. Hachures on upper plate			If desired, "2nd option" and "3rd option" symbols may be used to show other types or generations of detachment faults.
2.10.6	Detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable, location inferred. Hachures on upper plate			
2.10.7	Detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location concealed. Hachures on upper plate			
2.10.8	Detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable, location concealed. Hachures on upper plate			
2.10.9	Detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location accurate. Boxes on upper plate			May be used to show either normal (extensional) or thrust (compressional) offset. Boxes indicate overall fault type (detachment fault); they are not placed at specific localities where observations have been made.
2.10.10	Detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable, location accurate. Boxes on upper plate			
2.10.11	Detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location approximate. Boxes on upper plate			In cross section, use paired arrows to show relative motion of detachment faults (see Section 2.11).
2.10.12	Detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable, location approximate. Boxes on upper plate			
2.10.13	Detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location inferred. Boxes on upper plate			If desired, "2nd option" and "3rd option" symbols may be used to show other types or generations of detachment faults.
2.10.14	Detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable, location inferred. Boxes on upper plate			
2.10.15	Detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location concealed. Boxes on upper plate			
2.10.16	Detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable, location concealed. Boxes on upper plate			
2.10.17	Detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location accurate. Boxes on upper plate			
2.10.18	Detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable, location accurate. Boxes on upper plate			
2.10.19	Detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location approximate. Boxes on upper plate			
2.10.20	Detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable, location approximate. Boxes on upper plate			
2.10.21	Detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location inferred. Boxes on upper plate			
2.10.22	Detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable, location inferred. Boxes on upper plate			
2.10.23	Detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location concealed. Boxes on upper plate			
2.10.24	Detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable, location concealed. Boxes on upper plate			

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.10—Detachment faults (sense of slip unspecified) (continued)				
2.10.25	Master detachment fault (sense of slip unspecified) — Identity and existence certain, location accurate. Hachures on upper plate			May be used to show either normal (extensional) or thrust (compressional) offset. Hachures indicate overall fault type (master detachment fault); they are not placed at specific localities where observations have been made.
2.10.26	Master detachment fault (sense of slip unspecified) — Identity or existence questionable, location accurate. Hachures on upper plate			
2.10.27	Master detachment fault (sense of slip unspecified) — Identity and existence certain, location approximate. Hachures on upper plate			In cross section, use paired arrows to show relative motion of master detachment faults (see Section 2.11).
2.10.28	Master detachment fault (sense of slip unspecified) — Identity or existence questionable, location approximate. Hachures on upper plate			
2.10.29	Master detachment fault (sense of slip unspecified) — Identity and existence certain, location inferred. Hachures on upper plate			
2.10.30	Master detachment fault (sense of slip unspecified) — Identity or existence questionable, location inferred. Hachures on upper plate			
2.10.31	Master detachment fault (sense of slip unspecified) — Identity and existence certain, location concealed. Hachures on upper plate			
2.10.32	Master detachment fault (sense of slip unspecified) — Identity or existence questionable, location concealed. Hachures on upper plate			
2.10.33	Listic fault at head of detachment fault (sense of slip unspecified)— Identity and existence certain, location accurate. Ticks on upper plate			May be used to show either normal (extensional) or thrust (compressional) offset. Ticks indicate overall fault type (listric fault at head of detachment fault); they are not placed at specific localities where observations have been made.
2.10.34	Listic fault at head of detachment fault (sense of slip unspecified)— Identity or existence questionable, location accurate. Ticks on upper plate			
2.10.35	Listic fault at head of detachment fault (sense of slip unspecified)— Identity and existence certain, location approximate. Ticks on upper plate			In cross section, use paired arrows to show relative motion of listric faults at head of detachment faults (see Section 2.11).
2.10.36	Listic fault at head of detachment fault (sense of slip unspecified)— Identity or existence questionable, location approximate. Ticks on upper plate			
2.10.37	Listic fault at head of detachment fault (sense of slip unspecified)— Identity and existence certain, location inferred. Ticks on upper plate			
2.10.38	Listic fault at head of detachment fault (sense of slip unspecified)— Identity or existence questionable, location inferred. Ticks on upper plate			
2.10.39	Listic fault at head of detachment fault (sense of slip unspecified)— Identity and existence certain, location concealed. Ticks on upper plate			
2.10.40	Listic fault at head of detachment fault (sense of slip unspecified)— Identity or existence questionable, location concealed. Ticks on upper plate			

*For more information, see general guidelines on pages A-i to A-v.

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.11—Line-symbol decorations and notations for faults				
2.11.1	Fault showing local normal offset (1st option)—Ball and bar on downthrown block		tick length 1.0 mm; lineweight .175 mm lineweight .375 mm	Place line-symbol decorations where observations have been made.
2.11.2	Fault showing local normal offset (2nd option)—U, upthrown block; D, downthrown block			Line-symbol decorations may be added to any type or style of fault to show local relative motion or geomorphic relations. Line-symbol decorations may also be added to faults in places where local geomorphic features may indicate an apparent offset but where true sense of displacement is unknown.
2.11.3	Fault showing local reverse offset—Showing dip value and direction. U, upthrown block; D, downthrown block			
2.11.4	Fault showing local right-lateral strike-slip offset—Arrows show relative motion			
2.11.5	Fault showing local left-lateral strike-slip offset—Arrows show relative motion			
2.11.6	Fault showing local right-lateral oblique-slip offset—Arrows show relative motion; ball and bar on downthrown block			
2.11.7	Fault showing local left-lateral oblique-slip offset—Arrows show relative motion; ball and bar on downthrown block			Place tick, arrow, or other line-symbol decoration where observation was made. Add arrowhead or '90' to ticks showing dip if necessary for clarity.
2.11.8	Inclined fault (1st option)—Showing dip value and direction		tick length 1.75 mm; lineweight .225 mm	
2.11.9	Inclined fault (2nd option)—Showing dip value and direction		tick length 1.375 mm; lineweight .225 mm	
2.11.10	Vertical or near-vertical fault (1st option)		tick length 2.5 mm; lineweight .225 mm	
2.11.11	Vertical or near-vertical fault (2nd option)			
2.11.12	Lineation on fault surface—Showing bearing and plunge			Place displacement value where measurement was made.
2.11.13	Lineation on inclined fault surface—Tick shows fault dip value and direction; arrow shows bearing and plunge of lineation		tick length 1.75 mm; lineweight .225 mm	
2.11.14	Fault—Showing amount of local displacement			
2.11.15	Fault—Showing name	<u>GOLDEN FAULT</u>	<u>GOLDEN FAULT</u> ← H-8	
2.11.16	Normal fault (in cross section)—Arrows show relative motion			May be combined with paired arrows to show oblique-slip offset.
2.11.17	Thrust fault or reverse fault (in cross section)—Arrows show relative motion			
2.11.18	Detachment fault, movement of upper plate to left (in cross section)—Arrows show relative motion			
2.11.19	Detachment fault, movement of upper plate to right (in cross section)—Arrows show relative motion			
2.11.20	Strike-slip fault (in cross section) (1st option)—A, away from observer; T, toward observer			
2.11.21	Strike-slip fault (in cross section) (2nd option)—minus, away from observer; plus, toward observer			Usually reserved for use on page-size illustrations or on maps at scales of 1:1,000,000 or smaller.
2.11.22	Normal fault (on small-scale maps or figures)—Tick on downthrown side		tick length .8 mm; lineweight .25 mm	
2.11.23	Reverse fault (on small-scale maps or figures)—R on upthrown block			
2.11.24	Thrust fault (on small-scale maps or figures)—T on upper (tectonically higher) plate			

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.12—Fault scarps				
2.12.1	Scarp on fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity and existence certain, location accurate. Hachures point downscarp			
2.12.2	Scarp on fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity or existence questionable, location accurate. Hachures point downscarp			
2.12.3	Scarp on fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity and existence certain, location approximate. Hachures point downscarp			
2.12.4	Scarp on fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity or existence questionable, location approximate. Hachures point downscarp			
2.12.5	Scarp on normal fault—Identity and existence certain, location accurate. Ball and bar on downthrown block. Hachures point downscarp			
2.12.6	Scarp on normal fault—Identity or existence questionable, location accurate. Ball and bar on downthrown block. Hachures point downscarp			
2.12.7	Scarp on normal fault—Identity and existence certain, location approximate. Ball and bar on downthrown block. Hachures point downscarp			
2.12.8	Scarp on normal fault—Identity or existence questionable, location approximate. Ball and bar on downthrown block. Hachures point downscarp			
2.12.9	Scarp on low-angle normal fault—Identity and existence certain, location accurate. Half-circles on downthrown block. Hachures point downscarp			
2.12.10	Scarp on low-angle normal fault—Identity or existence questionable, location accurate. Half-circles on downthrown block. Hachures point downscarp			
2.12.11	Scarp on low-angle normal fault—Identity and existence certain, location approximate. Half-circles on downthrown block. Hachures point downscarp			
2.12.12	Scarp on low-angle normal fault—Identity or existence questionable, location approximate. Half-circles on downthrown block. Hachures point downscarp			
2.12.13	Scarp on low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location accurate. Half-circles on upper plate. Hachures point downscarp			
2.12.14	Scarp on low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable, location accurate. Half-circles on upper plate. Hachures point downscarp			
2.12.15	Scarp on low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location approximate. Half-circles on upper plate. Hachures point downscarp			
2.12.16	Scarp on low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable, location approximate. Half-circles on upper plate. Hachures point downscarp			
2.12.17	Scarp on reverse fault—Identity and existence certain, location accurate. Rectangles on upthrown block. Hachures point downscarp			
2.12.18	Scarp on reverse fault—Identity or existence questionable, location accurate. Rectangles on upthrown block. Hachures point downscarp			
2.12.19	Scarp on reverse fault—Identity and existence certain, location approximate. Rectangles on upthrown block. Hachures point downscarp			
2.12.20	Scarp on reverse fault—Identity or existence questionable, location approximate. Rectangles on upthrown block. Hachures point downscarp			

*For more information, see general guidelines on pages A-i to A-v.

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.12—Fault scarps (continued)				
2.12.21	Scarp on rotational or scissor fault, reverse-slip offset—Identity and existence certain, location accurate. Rectangles on upthrown block. Hachures point downscarp			
2.12.22	Scarp on rotational or scissor fault, reverse-slip offset—Identity or existence questionable, location accurate. Rectangles on upthrown block. Hachures point downscarp			
2.12.23	Scarp on rotational or scissor fault, reverse-slip offset—Identity and existence certain, location approximate. Rectangles on upthrown block. Hachures point downscarp			
2.12.24	Scarp on rotational or scissor fault, reverse-slip offset—Identity or existence questionable, location approximate. Rectangles on upthrown block. Hachures point downscarp			
2.12.25	Scarp on rotational or scissor fault, normal-slip offset—Identity and existence certain, location accurate. Rectangles on downthrown block. Hachures point downscarp			
2.12.26	Scarp on rotational or scissor fault, normal-slip offset—Identity or existence questionable, location accurate. Rectangles on downthrown block. Hachures point downscarp			
2.12.27	Scarp on rotational or scissor fault, normal-slip offset—Identity and existence certain, location approximate. Rectangles on downthrown block. Hachures point downscarp			
2.12.28	Scarp on rotational or scissor fault, normal-slip offset—Identity or existence questionable, location approximate. Rectangles on downthrown block. Hachures point downscarp			
2.12.29	Scarp on strike-slip fault, right-lateral offset—Identity and existence certain, location accurate. Arrows show relative motion. Hachures point downscarp			
2.12.30	Scarp on strike-slip fault, right-lateral offset—Identity or existence questionable, location accurate. Arrows show relative motion. Hachures point downscarp			
2.12.31	Scarp on strike-slip fault, right-lateral offset—Identity and existence certain, location approximate. Arrows show relative motion. Hachures point downscarp			
2.12.32	Scarp on strike-slip fault, right-lateral offset—Identity or existence questionable, location approximate. Arrows show relative motion. Hachures point downscarp			
2.12.33	Scarp on strike-slip fault, left-lateral offset—Identity and existence certain, location accurate. Arrows show relative motion. Hachures point downscarp			
2.12.34	Scarp on strike-slip fault, left-lateral offset—Identity or existence questionable, location accurate. Arrows show relative motion. Hachures point downscarp			
2.12.35	Scarp on strike-slip fault, left-lateral offset—Identity and existence certain, location approximate. Arrows show relative motion. Hachures point downscarp			
2.12.36	Scarp on strike-slip fault, left-lateral offset—Identity or existence questionable, location approximate. Arrows show relative motion. Hachures point downscarp			
2.12.37	Scarp on oblique-slip fault, right-lateral offset—Identity and existence certain, location accurate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp			
2.12.38	Scarp on oblique-slip fault, right-lateral offset—Identity or existence questionable, location accurate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp			
2.12.39	Scarp on oblique-slip fault, right-lateral offset—Identity and existence certain, location approximate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp			
2.12.40	Scarp on oblique-slip fault, right-lateral offset—Identity or existence questionable, location approximate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp			
2.12.41	Scarp on oblique-slip fault, left-lateral offset—Identity and existence certain, location accurate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp			
2.12.42	Scarp on oblique-slip fault, left-lateral offset—Identity or existence questionable, location accurate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp			
2.12.43	Scarp on oblique-slip fault, left-lateral offset—Identity and existence certain, location approximate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp			
2.12.44	Scarp on oblique-slip fault, left-lateral offset—Identity or existence questionable, location approximate. Arrows show relative motion; ball and bar on downthrown block. Hachures point downscarp			

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.12—Fault scarps (continued)				
2.12.45	Scarp on thrust fault (1st option)—Identity and existence certain, location accurate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp			
2.12.46	Scarp on thrust fault (1st option)—Identity or existence questionable, location accurate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp			
2.12.47	Scarp on thrust fault (1st option)—Identity and existence certain, location approximate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp			
2.12.48	Scarp on thrust fault (1st option)—Identity or existence questionable, location approximate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp			
2.12.49	Scarp on thrust fault (2nd option)—Identity and existence certain, location accurate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp			
2.12.50	Scarp on thrust fault (2nd option)—Identity or existence questionable, location accurate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp			
2.12.51	Scarp on thrust fault (2nd option)—Identity and existence certain, location approximate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp			
2.12.52	Scarp on thrust fault (2nd option)—Identity or existence questionable, location approximate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp			
2.12.53	Scarp on thrust fault (3rd option)—Identity and existence certain, location accurate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp			
2.12.54	Scarp on thrust fault (3rd option)—Identity or existence questionable, location accurate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp			
2.12.55	Scarp on thrust fault (3rd option)—Identity and existence certain, location approximate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp			
2.12.56	Scarp on thrust fault (3rd option)—Identity or existence questionable, location approximate. Sawteeth on upper (tectonically higher) plate. Hachures point downscarp			
2.12.57	Scarp on overturned thrust fault (1st option)—Identity and existence certain, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp			
2.12.58	Scarp on overturned thrust fault (1st option)—Identity or existence questionable, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp			
2.12.59	Scarp on overturned thrust fault (1st option)—Identity and existence certain, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp			
2.12.60	Scarp on overturned thrust fault (1st option)—Identity or existence questionable, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp			
2.12.61	Scarp on overturned thrust fault (2nd option)—Identity and existence certain, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp			
2.12.62	Scarp on overturned thrust fault (2nd option)—Identity or existence questionable, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp			
2.12.63	Scarp on overturned thrust fault (2nd option)—Identity and existence certain, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp			
2.12.64	Scarp on overturned thrust fault (2nd option)—Identity or existence questionable, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp			
2.12.65	Scarp on overturned thrust fault (3rd option)—Identity and existence certain, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp			
2.12.66	Scarp on overturned thrust fault (3rd option)—Identity or existence questionable, location accurate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp			
2.12.67	Scarp on overturned thrust fault (3rd option)—Identity and existence certain, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp			
2.12.68	Scarp on overturned thrust fault (3rd option)—Identity or existence questionable, location approximate. Bars on tectonically higher plate (footwall); sawteeth in direction of dip. Hachures point downscarp			

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.12—Fault scarps (continued)				
2.12.69	Scarp on detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location accurate. Long-hachure pairs on upper plate. Shorter, widely spaced hachures point downscarp			
2.12.70	Scarp on detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable, location accurate. Long-hachure pairs on upper plate. Shorter, widely spaced hachures point downscarp			
2.12.71	Scarp on detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location approximate. Long-hachure pairs on upper plate. Shorter, widely spaced hachures point downscarp			
2.12.72	Scarp on detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable, location approximate. Long-hachure pairs on upper plate. Shorter, widely spaced hachures point downscarp			
2.12.73	Scarp on detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location accurate. Boxes on upper plate. Hachures point downscarp			
2.12.74	Scarp on detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable, location accurate. Boxes on upper plate. Hachures point downscarp			
2.12.75	Scarp on detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location approximate. Boxes on upper plate. Hachures point downscarp			
2.12.76	Scarp on detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable, location approximate. Boxes on upper plate. Hachures point downscarp			
2.12.77	Scarp on detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location accurate. Boxes on upper plate. Hachures point downscarp			
2.12.78	Scarp on detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable, location accurate. Boxes on upper plate. Hachures point downscarp			
2.12.79	Scarp on detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location approximate. Boxes on upper plate. Hachures point downscarp			
2.12.80	Scarp on detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable, location approximate. Boxes on upper plate. Hachures point downscarp			
2.12.81	Scarp on master detachment fault (sense of slip unspecified)—Identity and existence certain, location accurate. Long-hachure triplets on upper plate. Shorter, widely spaced hachures point downscarp			
2.12.82	Scarp on master detachment fault (sense of slip unspecified)—Identity or existence questionable, location accurate. Long-hachure triplets on upper plate. Shorter, widely spaced hachures point downscarp			
2.12.83	Scarp on master detachment fault (sense of slip unspecified)—Identity and existence certain, location approximate. Long-hachure triplets on upper plate. Shorter, widely spaced hachures point downscarp			
2.12.84	Scarp on master detachment fault (sense of slip unspecified)—Identity or existence questionable, location approximate. Long-hachure triplets on upper plate. Shorter, widely spaced hachures point downscarp			
2.12.85	Scarp on listric fault at head of detachment fault (sense of slip unspecified)—Identity and existence certain, location accurate. Single (longer) ticks on upper plate. Shorter, widely spaced hachures point downscarp			
2.12.86	Scarp on listric fault at head of detachment fault (sense of slip unspecified)—Identity or existence questionable, location accurate. Single (longer) ticks on upper plate. Shorter, widely spaced hachures point downscarp			
2.12.87	Scarp on listric fault at head of detachment fault (sense of slip unspecified)—Identity and existence certain, location approximate. Single (longer) ticks on upper plate. Shorter, widely spaced hachures point downscarp			
2.12.88	Scarp on listric fault at head of detachment fault (sense of slip unspecified)—Identity or existence questionable, location approximate. Single (longer) ticks on upper plate. Shorter, widely spaced hachures point downscarp			

*For more information, see general guidelines on pages A-i to A-v.

2—FAULTS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
2.13—Quaternary faulting				
2.13.1	Fault showing displacement during historic time (includes areas of known fault creep)			Although only shown here on "identity and existence certain," generic faults, color may be added to any type or style of fault to highlight where geomorphic evidence indicates displacement during Quaternary time.
2.13.2	Fault showing displacement during Holocene time			
2.13.3	Fault showing displacement during late Quaternary time			
2.13.4	Fault showing displacement during Quaternary time (undifferentiated)			
2.14—Shear zones; mylonite zones; fault-breccia zones				
2.14.1	Ductile shear zone or mylonite zone—May or may not be associated with mappable faults			Orient S-shaped symbols to indicate linear trend of zone; spacing may be varied to show intensity of shear. Width of zones may vary. Patterns may either overprint other map units or be used as stand-alone map units (if zones have well-defined boundaries).
2.14.2	Zone of sheared rock within fault			
2.14.3	Fault-breccia zone or zone of broken rock within fault			
2.14.4	Fault-breccia zone or zone of broken rock around fault			
2.15—Small, minor faults				
2.15.1	Small, minor inclined fault—Showing strike and dip			Use to show small, minor faults that are observed in outcrop but that cannot be traced away from that outcrop.
2.15.2	Small, minor vertical or near-vertical fault—Showing strike			
2.15.3	Small, minor shear fault—Showing dip. Arrow shows direction of relative horizontal displacement			


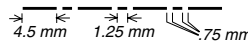


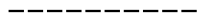

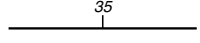
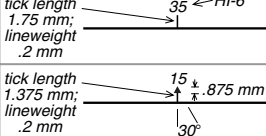
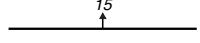
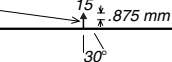
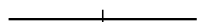

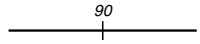
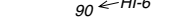

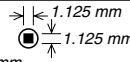

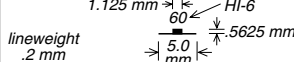

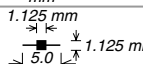

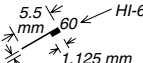





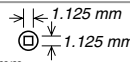

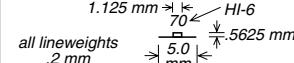

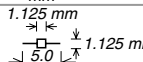

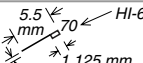



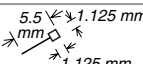
*For more information, see general guidelines on pages A-i to A-v.

3—BOUNDARIES LOCATED BY GEOPHYSICAL SURVEYS

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
3.1—Boundaries located by geophysical methods				
3.1.1	Boundary located by aeromagnetic survey	— — — — — AM	lineweight .2 mm 3.5 mm AM ← H-8 5 mm	Use for boundaries that have been defined by measured contrasts in rock properties but that may not be definitively identifiable as either a contact or a fault by survey methods. May be shown in red or other colors.
3.1.2	Boundary located by ground magnetic survey	— — — — — M	— — — — — M	
3.1.3	Boundary located by gravity survey	— — — — — G	— — — — — G	
3.1.4	Boundary located by radiometric survey	— — — — — RM	— — — — — RM	
3.1.5	Boundary located by seismic reflection survey	— — — — — S	— — — — — S	
3.1.6	Boundary located by induced polarization survey	— — — — — IP	— — — — — IP	
3.1.7	Boundary located by electromagnetic survey	— — — — — EM	— — — — — EM	
3.1.8	Boundary located by resistivity survey	— — — — — R	— — — — — R	
3.1.9	Boundary located by magnetotelluric survey	— — — — — MT	— — — — — MT	
3.2—Faults located by geophysical methods				
3.2.1	Fault located by aeromagnetic survey	— — — — — AM	lineweight .375 mm 3.5 mm AM ← H-8 5 mm	Use for boundaries that have been defined by measured contrasts in rock properties and that also can be identified as faults by geophysical survey or by other evidence that contributes to survey. May be shown in red or other colors.
3.2.2	Fault located by ground magnetic survey	— — — — — M	— — — — — M	
3.2.3	Fault located by gravity survey	— — — — — G	— — — — — G	
3.2.4	Fault located by radiometric survey	— — — — — RM	— — — — — RM	
3.2.5	Fault located by seismic reflection survey	— — — — — S	— — — — — S	
3.2.6	Fault located by induced polarization survey	— — — — — IP	— — — — — IP	
3.2.7	Fault located by electromagnetic survey	— — — — — EM	— — — — — EM	
3.2.8	Fault located by resistivity survey	— — — — — R	— — — — — R	
3.2.9	Fault located by magnetotelluric survey	— — — — — MT	— — — — — MT	
3.3—Geophysical survey lines and stations				
3.3.1	Geophysical data collection line—Accurately located	— — — — —	lineweight .15 mm dash length 3.75 mm; spacing 3.75 mm	May be shown in red or other colors.
3.3.2	Geophysical data collection line—Located by aerial survey	— — — — —	lineweight .15 mm dash length 7.5 mm; spacing 7.5 mm	
3.3.3	Cross ticks showing location and orientation of data collection lines crossing geophysical boundary	+ + + + +	tick lineweight .15 mm 1.25 mm	
3.3.4	Horizontal control point	△	dot diameter .3 mm lineweight .2 mm 1.75 mm 60°	
3.3.5	Survey station	+	lineweight .2 mm 1.75 mm 1.75 mm	

*For more information, see general guidelines on pages A-i to A-v.

4—LINEAMENTS AND JOINTS

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
4.1—Lineaments				
4.1.1	Lineament		lineweight .375 mm 	Use to show linear features that have been determined from aerial photographs or remotely sensed imagery but not identified on the ground.
4.1.2	Lineament—Showing name	<u>OLYMPIC-WALLOWA</u>	<u>OLYMPIC-WALLOWA</u> ← H-7	
4.2—Joints				
4.2.1	Joint—Identity and existence certain, location accurate		lineweight .3 mm 	Use to show regional joint patterns or single joints that are mappable beyond outcrop. May also be shown in red or other colors.
4.2.2	Joint—Identity and existence certain, location approximate			
4.2.3	Inclined joint (1st option)—Showing dip value and direction		tick length 1.75 mm; lineweight .2 mm 	Place tick where observation was made. Add arrowhead or '90' to tick if necessary for clarity.
4.2.4	Inclined joint (2nd option)—Showing dip value and direction		tick length 1.375 mm; lineweight .2 mm 	
4.2.5	Vertical or subvertical joint (1st option)		tick length 2.5 mm; lineweight .2 mm 	
4.2.6	Vertical or subvertical joint (2nd option)			
4.3—Small, minor joints				
4.3.1	Small, minor horizontal joint (1st option)		lineweight .2 mm circle diameter 2.5 mm 	Use to show small, minor joints that are observed in outcrop but that cannot be traced away from that outcrop. For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line. For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding). May also be shown in red or other colors.
4.3.2	Small, minor inclined joint (1st option)—Showing strike and dip			
4.3.3	Small, minor vertical or near-vertical joint (1st option)—Showing strike			
4.3.4	Small, minor inclined (dip direction to right) joint, for multiple observations at one locality (1st option)—Showing strike and dip			
4.3.5	Small, minor inclined (dip direction to left) joint, for multiple observations at one locality (1st option)—Showing strike and dip			
4.3.6	Small, minor vertical or near-vertical joint, for multiple observations at one locality (1st option)—Showing strike			
4.3.7	Small, minor horizontal joint (2nd option)		all lineweights .2 mm circle diameter 2.5 mm 	
4.3.8	Small, minor inclined joint (2nd option)—Showing strike and dip			
4.3.9	Small, minor vertical or near-vertical joint (2nd option)—Showing strike			
4.3.10	Small, minor inclined (dip direction to right) joint, for multiple observations at one locality (2nd option)—Showing strike and dip			
4.3.11	Small, minor inclined (dip direction to left) joint, for multiple observations at one locality (2nd option)—Showing strike and dip			
4.3.12	Small, minor vertical or near-vertical joint, for multiple observations at one locality (2nd option)—Showing strike			

*For more information, see general guidelines on pages A-i to A-v.

5—FOLDS

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.1—Anticlines				
5.1.1	Anticline (1st option)—Identity and existence certain, location accurate			Place fold trace where axial surface of anticline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (anticline); do not place at specific locality where observation was made.
5.1.2	Anticline (1st option)—Identity or existence questionable, location accurate			
5.1.3	Anticline (1st option)—Identity and existence certain, location approximate			Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.
5.1.4	Anticline (1st option)—Identity or existence questionable, location approximate			
5.1.5	Anticline (1st option)—Identity and existence certain, location inferred			May also be shown in black or other colors.
5.1.6	Anticline (1st option)—Identity or existence questionable, location inferred			
5.1.7	Anticline (1st option)—Identity and existence certain, location concealed			
5.1.8	Anticline (1st option)—Identity or existence questionable, location concealed			
5.1.9	Anticline (2nd option)—Identity and existence certain, location accurate			
5.1.10	Anticline (2nd option)—Identity or existence questionable, location accurate			
5.1.11	Anticline (2nd option)—Identity and existence certain, location approximate			
5.1.12	Anticline (2nd option)—Identity or existence questionable, location approximate			
5.1.13	Anticline (2nd option)—Identity and existence certain, location inferred			
5.1.14	Anticline (2nd option)—Identity or existence questionable, location inferred			
5.1.15	Anticline (2nd option)—Identity and existence certain, location concealed			
5.1.16	Anticline (2nd option)—Identity or existence questionable, location concealed			

*For more information, see general guidelines on pages A-i to A-v.

5—FOLDS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.2—Antiforms				
5.2.1	Antiform (1st option)—Identity and existence certain, location accurate			Place fold trace where axial surface of antiform intersects the ground surface.
5.2.2	Antiform (1st option)—Identity or existence questionable, location accurate			
5.2.3	Antiform (1st option)—Identity and existence certain, location approximate			Place arrows at places along fold trace to indicate overall fold type (antiform); do not place at specific locality where observation was made.
5.2.4	Antiform (1st option)—Identity or existence questionable, location approximate			
5.2.5	Antiform (1st option)—Identity and existence certain, location inferred			Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.
5.2.6	Antiform (1st option)—Identity or existence questionable, location inferred			
5.2.7	Antiform (1st option)—Identity and existence certain, location concealed			May also be shown in black or other colors.
5.2.8	Antiform (1st option)—Identity or existence questionable, location concealed			
5.2.9	Antiform (2nd option)—Identity and existence certain, location accurate			
5.2.10	Antiform (2nd option)—Identity or existence questionable, location accurate			
5.2.11	Antiform (2nd option)—Identity and existence certain, location approximate			
5.2.12	Antiform (2nd option)—Identity or existence questionable, location approximate			
5.2.13	Antiform (2nd option)—Identity and existence certain, location inferred			
5.2.14	Antiform (2nd option)—Identity or existence questionable, location inferred			
5.2.15	Antiform (2nd option)—Identity and existence certain, location concealed			
5.2.16	Antiform (2nd option)—Identity or existence questionable, location concealed			

*For more information, see general guidelines on pages A-i to A-v.

5—FOLDS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.3—Asymmetric, overturned, and inverted anticlines				
5.3.1	Asymmetric anticline (1st option)—Identity and existence certain, location accurate. Beds are upright; shorter arrow on steeper limb			Place fold trace where axial surface of asymmetric anticline intersects the ground surface.
5.3.2	Asymmetric anticline (1st option)—Identity or existence questionable, location accurate. Beds are upright; shorter arrow on steeper limb			
5.3.3	Asymmetric anticline (1st option)—Identity and existence certain, location approximate. Beds are upright; shorter arrow on steeper limb			
5.3.4	Asymmetric anticline (1st option)—Identity or existence questionable, location approximate. Beds are upright; shorter arrow on steeper limb			
5.3.5	Asymmetric anticline (1st option)—Identity and existence certain, location inferred. Beds are upright; shorter arrow on steeper limb			Place arrows at places along fold trace to indicate overall fold type (asymmetric anticline); do not place at specific locality where observation was made. Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors.
5.3.6	Asymmetric anticline (1st option)—Identity or existence questionable, location inferred. Beds are upright; shorter arrow on steeper limb			
5.3.7	Asymmetric anticline (1st option)—Identity and existence certain, location concealed. Beds are upright; shorter arrow on steeper limb			
5.3.8	Asymmetric anticline (1st option)—Identity or existence questionable, location concealed. Beds are upright; shorter arrow on steeper limb			
5.3.9	Asymmetric anticline (2nd option)—Identity and existence certain, location accurate. Beds are upright; shorter arrow on steeper limb			
5.3.10	Asymmetric anticline (2nd option)—Identity or existence questionable, location accurate. Beds are upright; shorter arrow on steeper limb			
5.3.11	Asymmetric anticline (2nd option)—Identity and existence certain, location approximate. Beds are upright; shorter arrow on steeper limb			
5.3.12	Asymmetric anticline (2nd option)—Identity or existence questionable, location approximate. Beds are upright; shorter arrow on steeper limb			
5.3.13	Asymmetric anticline (2nd option)—Identity and existence certain, location inferred. Beds are upright; shorter arrow on steeper limb			
5.3.14	Asymmetric anticline (2nd option)—Identity or existence questionable, location inferred. Beds are upright; shorter arrow on steeper limb			
5.3.15	Asymmetric anticline (2nd option)—Identity and existence certain, location concealed. Beds are upright; shorter arrow on steeper limb			
5.3.16	Asymmetric anticline (2nd option)—Identity or existence questionable, location concealed. Beds are upright; shorter arrow on steeper limb			
5.3.17	Overturned anticline (1st option)—Identity and existence certain, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs			Place fold trace where axial surface of overturned anticline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (overturned anticline); do not place at specific locality where observation was made. Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors.
5.3.18	Overturned anticline (1st option)—Identity or existence questionable, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs			
5.3.19	Overturned anticline (1st option)—Identity and existence certain, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs			
5.3.20	Overturned anticline (1st option)—Identity or existence questionable, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs			
5.3.21	Overturned anticline (1st option)—Identity and existence certain, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs			
5.3.22	Overturned anticline (1st option)—Identity or existence questionable, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs			
5.3.23	Overturned anticline (1st option)—Identity and existence certain, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs			
5.3.24	Overturned anticline (1st option)—Identity or existence questionable, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs			

5—FOLDS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.3—Asymmetric, overturned, and inverted anticlines (continued)				
5.3.25	Overturned anticline (2nd option)—Identity and existence certain, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs			Place fold trace where axial surface of overturned anticline intersects the ground surface.
5.3.26	Overturned anticline (2nd option)—Identity or existence questionable, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs			
5.3.27	Overturned anticline (2nd option)—Identity and existence certain, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs			Place arrows at places along fold trace to indicate overall fold type (overturned anticline); do not place at specific locality where observation was made.
5.3.28	Overturned anticline (2nd option)—Identity or existence questionable, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs			
5.3.29	Overturned anticline (2nd option)—Identity and existence certain, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs			Arrowheads may be added to show direction of plunge (see Section 5.10).
5.3.30	Overturned anticline (2nd option)—Identity or existence questionable, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs			
5.3.31	Overturned anticline (2nd option)—Identity and existence certain, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs			Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.
5.3.32	Overturned anticline (2nd option)—Identity or existence questionable, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs			
5.3.33	Inverted anticline (1st option)—Identity and existence certain, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs			Place fold trace where axial surface of inverted anticline intersects the ground surface.
5.3.34	Inverted anticline (1st option)—Identity or existence questionable, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.3.35	Inverted anticline (1st option)—Identity and existence certain, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs			Place arrows at places along fold trace to indicate overall fold type (inverted anticline); do not place at specific locality where observation was made.
5.3.36	Inverted anticline (1st option)—Identity or existence questionable, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.3.37	Inverted anticline (1st option)—Identity and existence certain, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs			Arrowheads may be added to show direction of plunge (see Section 5.10).
5.3.38	Inverted anticline (1st option)—Identity or existence questionable, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.3.39	Inverted anticline (1st option)—Identity and existence certain, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs			Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.
5.3.40	Inverted anticline (1st option)—Identity or existence questionable, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.3.41	Inverted anticline (2nd option)—Identity and existence certain, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs			May also be shown in black or other colors.
5.3.42	Inverted anticline (2nd option)—Identity or existence questionable, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.3.43	Inverted anticline (2nd option)—Identity and existence certain, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.3.44	Inverted anticline (2nd option)—Identity or existence questionable, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.3.45	Inverted anticline (2nd option)—Identity and existence certain, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.3.46	Inverted anticline (2nd option)—Identity or existence questionable, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.3.47	Inverted anticline (2nd option)—Identity and existence certain, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.3.48	Inverted anticline (2nd option)—Identity or existence questionable, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs			

5—FOLDS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.4—Antiformal sheath folds				
5.4.1	Antiformal sheath fold (1st option)—Identity and existence certain, location accurate			Place fold trace where axial surface of antiformal sheath fold intersects the ground surface.
5.4.2	Antiformal sheath fold (1st option)—Identity or existence questionable, location accurate			
5.4.3	Antiformal sheath fold (1st option)—Identity and existence certain, location approximate			Place arrows at places along fold trace to indicate overall fold type (antiformal sheath fold); do not place at specific locality where observation was made.
5.4.4	Antiformal sheath fold (1st option)—Identity or existence questionable, location approximate			
5.4.5	Antiformal sheath fold (1st option)—Identity and existence certain, location inferred			Arrowheads may be added to show direction of plunge (see Section 5.10).
5.4.6	Antiformal sheath fold (1st option)—Identity or existence questionable, location inferred			
5.4.7	Antiformal sheath fold (1st option)—Identity and existence certain, location concealed			Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.
5.4.8	Antiformal sheath fold (1st option)—Identity or existence questionable, location concealed			
5.4.9	Antiformal sheath fold (2nd option)—Identity and existence certain, location accurate			May also be shown in black or other colors.
5.4.10	Antiformal sheath fold (2nd option)—Identity or existence questionable, location accurate			
5.4.11	Antiformal sheath fold (2nd option)—Identity and existence certain, location approximate			
5.4.12	Antiformal sheath fold (2nd option)—Identity or existence questionable, location approximate			
5.4.13	Antiformal sheath fold (2nd option)—Identity and existence certain, location inferred			
5.4.14	Antiformal sheath fold (2nd option)—Identity or existence questionable, location inferred			
5.4.15	Antiformal sheath fold (2nd option)—Identity and existence certain, location concealed			
5.4.16	Antiformal sheath fold (2nd option)—Identity or existence questionable, location concealed			

*For more information, see general guidelines on pages A-i to A-v.

5—FOLDS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.5—Synclines				
5.5.1	Syncline (1st option)—Identity and existence certain, location accurate			Place fold trace where axial surface of syncline intersects the ground surface.
5.5.2	Syncline (1st option)—Identity or existence questionable, location accurate			
5.5.3	Syncline (1st option)—Identity and existence certain, location approximate			Place arrows at places along fold trace to indicate overall fold type (syncline); do not place at specific locality where observation was made.
5.5.4	Syncline (1st option)—Identity or existence questionable, location approximate			
5.5.5	Syncline (1st option)—Identity and existence certain, location inferred			Arrowheads may be added to show direction of plunge (see Section 5.10).
5.5.6	Syncline (1st option)—Identity or existence questionable, location inferred			
5.5.7	Syncline (1st option)—Identity and existence certain, location concealed			Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.
5.5.8	Syncline (1st option)—Identity or existence questionable, location concealed			
5.5.9	Syncline (2nd option)—Identity and existence certain, location accurate			May also be shown in black or other colors.
5.5.10	Syncline (2nd option)—Identity or existence questionable, location accurate			
5.5.11	Syncline (2nd option)—Identity and existence certain, location approximate			
5.5.12	Syncline (2nd option)—Identity or existence questionable, location approximate			
5.5.13	Syncline (2nd option)—Identity and existence certain, location inferred			
5.5.14	Syncline (2nd option)—Identity or existence questionable, location inferred			
5.5.15	Syncline (2nd option)—Identity and existence certain, location concealed			
5.5.16	Syncline (2nd option)—Identity or existence questionable, location concealed			

*For more information, see general guidelines on pages A-i to A-v.

5—FOLDS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*	
5.6—Synforms					
5.6.1	Synform (1st option)—Identity and existence certain, location accurate			Place fold trace where axial surface of synform intersects the ground surface.	
5.6.2	Synform (1st option)—Identity or existence questionable, location accurate				
5.6.3	Synform (1st option)—Identity and existence certain, location approximate			Place arrows at places along fold trace to indicate overall fold type (synform); do not place at specific locality where observation was made.	
5.6.4	Synform (1st option)—Identity or existence questionable, location approximate				
5.6.5	Synform (1st option)—Identity and existence certain, location inferred			Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.	
5.6.6	Synform (1st option)—Identity or existence questionable, location inferred				
5.6.7	Synform (1st option)—Identity and existence certain, location concealed			May also be shown in black or other colors.	
5.6.8	Synform (1st option)—Identity or existence questionable, location concealed				
5.6.9	Synform (2nd option)—Identity and existence certain, location accurate				
5.6.10	Synform (2nd option)—Identity or existence questionable, location accurate				
5.6.11	Synform (2nd option)—Identity and existence certain, location approximate				
5.6.12	Synform (2nd option)—Identity or existence questionable, location approximate				
5.6.13	Synform (2nd option)—Identity and existence certain, location inferred				
5.6.14	Synform (2nd option)—Identity or existence questionable, location inferred				
5.6.15	Synform (2nd option)—Identity and existence certain, location concealed				
5.6.16	Synform (2nd option)—Identity or existence questionable, location concealed				

*For more information, see general guidelines on pages A-i to A-v.

5—FOLDS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.7—Asymmetric, overturned, and inverted synclines				
5.7.1	Asymmetric syncline (1st option)—Identity and existence certain, location accurate. Beds are upright; shorter arrow on steeper limb			Place fold trace where axial surface of asymmetric syncline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (asymmetric syncline); do not place at specific locality where observation was made. Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors.
5.7.2	Asymmetric syncline (1st option)—Identity or existence questionable, location accurate. Beds are upright; shorter arrow on steeper limb			
5.7.3	Asymmetric syncline (1st option)—Identity and existence certain, location approximate. Beds are upright; shorter arrow on steeper limb			
5.7.4	Asymmetric syncline (1st option)—Identity or existence questionable, location approximate. Beds are upright; shorter arrow on steeper limb			
5.7.5	Asymmetric syncline (1st option)—Identity and existence certain, location inferred. Beds are upright; shorter arrow on steeper limb			
5.7.6	Asymmetric syncline (1st option)—Identity or existence questionable, location inferred. Beds are upright; shorter arrow on steeper limb			
5.7.7	Asymmetric syncline (1st option)—Identity and existence certain, location concealed. Beds are upright; shorter arrow on steeper limb			
5.7.8	Asymmetric syncline (1st option)—Identity or existence questionable, location concealed. Beds are upright; shorter arrow on steeper limb			
5.7.9	Asymmetric syncline (2nd option)—Identity and existence certain, location accurate. Beds are upright; shorter arrow on steeper limb			
5.7.10	Asymmetric syncline (2nd option)—Identity or existence questionable, location accurate. Beds are upright; shorter arrow on steeper limb			
5.7.11	Asymmetric syncline (2nd option)—Identity and existence certain, location approximate. Beds are upright; shorter arrow on steeper limb			
5.7.12	Asymmetric syncline (2nd option)—Identity or existence questionable, location approximate. Beds are upright; shorter arrow on steeper limb			
5.7.13	Asymmetric syncline (2nd option)—Identity and existence certain, location inferred. Beds are upright; shorter arrow on steeper limb			
5.7.14	Asymmetric syncline (2nd option)—Identity or existence questionable, location inferred. Beds are upright; shorter arrow on steeper limb			
5.7.15	Asymmetric syncline (2nd option)—Identity and existence certain, location concealed. Beds are upright; shorter arrow on steeper limb			
5.7.16	Asymmetric syncline (2nd option)—Identity or existence questionable, location concealed. Beds are upright; shorter arrow on steeper limb			
5.7.17	Overtuned syncline (1st option)—Identity and existence certain, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs			Place fold trace where axial surface of overtuned syncline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (overtuned syncline); do not place at specific locality where observation was made. Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors.
5.7.18	Overtuned syncline (1st option)—Identity or existence questionable, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs			
5.7.19	Overtuned syncline (1st option)—Identity and existence certain, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs			
5.7.20	Overtuned syncline (1st option)—Identity or existence questionable, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs			
5.7.21	Overtuned syncline (1st option)—Identity and existence certain, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs			
5.7.22	Overtuned syncline (1st option)—Identity or existence questionable, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs			
5.7.23	Overtuned syncline (1st option)—Identity and existence certain, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs			
5.7.24	Overtuned syncline (1st option)—Identity or existence questionable, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs			

5—FOLDS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.7—Asymmetric, overturned, and inverted synclines (continued)				
5.7.25	Overturned syncline (2nd option)—Identity and existence certain, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs			Place fold trace where axial surface of overturned syncline intersects the ground surface.
5.7.26	Overturned syncline (2nd option)—Identity or existence questionable, location accurate. Beds on one limb are overturned; arrows show dip direction of limbs			
5.7.27	Overturned syncline (2nd option)—Identity and existence certain, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs			Place arrows at places along fold trace to indicate overall fold type (overturned syncline); do not place at specific locality where observation was made.
5.7.28	Overturned syncline (2nd option)—Identity or existence questionable, location approximate. Beds on one limb are overturned; arrows show dip direction of limbs			
5.7.29	Overturned syncline (2nd option)—Identity and existence certain, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs			Arrowheads may be added to show direction of plunge (see Section 5.10).
5.7.30	Overturned syncline (2nd option)—Identity or existence questionable, location inferred. Beds on one limb are overturned; arrows show dip direction of limbs			
5.7.31	Overturned syncline (2nd option)—Identity and existence certain, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs			Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.
5.7.32	Overturned syncline (2nd option)—Identity or existence questionable, location concealed. Beds on one limb are overturned; arrows show dip direction of limbs			
5.7.33	Inverted syncline (1st option)—Identity and existence certain, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs			Place fold trace where axial surface of inverted syncline intersects the ground surface.
5.7.34	Inverted syncline (1st option)—Identity or existence questionable, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.7.35	Inverted syncline (1st option)—Identity and existence certain, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs			Place arrows at places along fold trace to indicate overall fold type (inverted syncline); do not place at specific locality where observation was made.
5.7.36	Inverted syncline (1st option)—Identity or existence questionable, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.7.37	Inverted syncline (1st option)—Identity and existence certain, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs			Arrowheads may be added to show direction of plunge (see Section 5.10).
5.7.38	Inverted syncline (1st option)—Identity or existence questionable, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.7.39	Inverted syncline (1st option)—Identity and existence certain, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs			Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.
5.7.40	Inverted syncline (1st option)—Identity or existence questionable, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.7.41	Inverted syncline (2nd option)—Identity and existence certain, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs			May also be shown in black or other colors.
5.7.42	Inverted syncline (2nd option)—Identity or existence questionable, location accurate. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.7.43	Inverted syncline (2nd option)—Identity and existence certain, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.7.44	Inverted syncline (2nd option)—Identity or existence questionable, location approximate. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.7.45	Inverted syncline (2nd option)—Identity and existence certain, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.7.46	Inverted syncline (2nd option)—Identity or existence questionable, location inferred. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.7.47	Inverted syncline (2nd option)—Identity and existence certain, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs			
5.7.48	Inverted syncline (2nd option)—Identity or existence questionable, location concealed. Beds on both limbs are overturned; arrows show dip direction of limbs			

5—FOLDS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.8—Synformal sheath folds				
5.8.1	Synformal sheath fold (1st option)—Identity and existence certain, location accurate			Place fold trace where axial surface of synformal sheath fold intersects the ground surface.
5.8.2	Synformal sheath fold (1st option)—Identity or existence questionable, location accurate			
5.8.3	Synformal sheath fold (1st option)—Identity and existence certain, location approximate			Place arrows at places along fold trace to indicate overall fold type (synformal sheath fold); do not place at specific locality where observation was made.
5.8.4	Synformal sheath fold (1st option)—Identity or existence questionable, location approximate			
5.8.5	Synformal sheath fold (1st option)—Identity and existence certain, location inferred			Arrowheads may be added to show direction of plunge (see Section 5.10).
5.8.6	Synformal sheath fold (1st option)—Identity or existence questionable, location inferred			
5.8.7	Synformal sheath fold (1st option)—Identity and existence certain, location concealed			Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.
5.8.8	Synformal sheath fold (1st option)—Identity or existence questionable, location concealed			
5.8.9	Synformal sheath fold (2nd option)—Identity and existence certain, location accurate			May also be shown in black or other colors.
5.8.10	Synformal sheath fold (2nd option)—Identity or existence questionable, location accurate			
5.8.11	Synformal sheath fold (2nd option)—Identity and existence certain, location approximate			
5.8.12	Synformal sheath fold (2nd option)—Identity or existence questionable, location approximate			
5.8.13	Synformal sheath fold (2nd option)—Identity and existence certain, location inferred			
5.8.14	Synformal sheath fold (2nd option)—Identity or existence questionable, location inferred			
5.8.15	Synformal sheath fold (2nd option)—Identity and existence certain, location concealed			
5.8.16	Synformal sheath fold (2nd option)—Identity or existence questionable, location concealed			

*For more information, see general guidelines on pages A-i to A-v.

5—FOLDS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.9—Monoclines				
5.9.1	Monocline (1st option)—Identity and existence certain, location accurate. Arrow shows direction of dip			Use to show monocline whose anticlinal and synclinal bends are too close together at map scale to show as separate fold traces.
5.9.2	Monocline (1st option)—Identity or existence questionable, location accurate. Arrow shows direction of dip			
5.9.3	Monocline (1st option)—Identity and existence certain, location approximate. Arrow shows direction of dip			Place fold trace where dip of surface connecting anticlinal and synclinal bends is at its maximum angle.
5.9.4	Monocline (1st option)—Identity or existence questionable, location approximate. Arrow shows direction of dip			
5.9.5	Monocline (1st option)—Identity and existence certain, location inferred. Arrow shows direction of dip			Place arrow at places along fold trace to indicate overall fold type (monocline); do not place at specific locality where observation was made.
5.9.6	Monocline (1st option)—Identity or existence questionable, location inferred. Arrow shows direction of dip			
5.9.7	Monocline (1st option)—Identity and existence certain, location concealed. Arrow shows direction of dip			Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.
5.9.8	Monocline (1st option)—Identity or existence questionable, location concealed. Arrow shows direction of dip			
5.9.9	Monocline (2nd option)—Identity and existence certain, location accurate. Arrow shows direction of dip			May also be shown in black or other colors.
5.9.10	Monocline (2nd option)—Identity or existence questionable, location accurate. Arrow shows direction of dip			
5.9.11	Monocline (2nd option)—Identity and existence certain, location approximate. Arrow shows direction of dip			
5.9.12	Monocline (2nd option)—Identity or existence questionable, location approximate. Arrow shows direction of dip			
5.9.13	Monocline (2nd option)—Identity and existence certain, location inferred. Arrow shows direction of dip			
5.9.14	Monocline (2nd option)—Identity or existence questionable, location inferred. Arrow shows direction of dip			
5.9.15	Monocline (2nd option)—Identity and existence certain, location concealed. Arrow shows direction of dip			
5.9.16	Monocline (2nd option)—Identity or existence questionable, location concealed. Arrow shows direction of dip			
5.9.17	Monocline, anticlinal bend (1st option)—Identity and existence certain, location accurate. Arrows show direction of dip; shorter arrow on steeper limb			Place fold trace where axial surface of anticlinal bend of monocline intersects the ground surface.
5.9.18	Monocline, anticlinal bend (1st option)—Identity or existence questionable, location accurate. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.19	Monocline, anticlinal bend (1st option)—Identity and existence certain, location approximate. Arrows show direction of dip; shorter arrow on steeper limb			Place arrows at places along fold trace to indicate overall fold type (anticlinal bend of monocline); do not place at specific locality where observation was made.
5.9.20	Monocline, anticlinal bend (1st option)—Identity or existence questionable, location approximate. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.21	Monocline, anticlinal bend (1st option)—Identity and existence certain, location inferred. Arrows show direction of dip; shorter arrow on steeper limb			Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type.
5.9.22	Monocline, anticlinal bend (1st option)—Identity or existence questionable, location inferred. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.23	Monocline, anticlinal bend (1st option)—Identity and existence certain, location concealed. Arrows show direction of dip; shorter arrow on steeper limb			May also be shown in black or other colors.
5.9.24	Monocline, anticlinal bend (1st option)—Identity or existence questionable, location concealed. Arrows show direction of dip; shorter arrow on steeper limb			

5—FOLDS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.9—Monoclines (continued)				
5.9.25	Monocline, anticlinal bend (2nd option)—Identity and existence certain, location accurate. Arrows show direction of dip; shorter arrow on steeper limb			Place fold trace where axial surface of anticlinal bend of monocline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (anticlinal bend of monocline); do not place at specific locality where observation was made. Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors.
5.9.26	Monocline, anticlinal bend (2nd option)—Identity or existence questionable, location accurate. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.27	Monocline, anticlinal bend (2nd option)—Identity and existence certain, location approximate. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.28	Monocline, anticlinal bend (2nd option)—Identity or existence questionable, location approximate. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.29	Monocline, anticlinal bend (2nd option)—Identity and existence certain, location inferred. Arrows show direction of dip; shorter arrow on steeper limb			Place fold trace where axial surface of synclinal bend of monocline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (synclinal bend of monocline); do not place at specific locality where observation was made. Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors.
5.9.30	Monocline, anticlinal bend (2nd option)—Identity or existence questionable, location inferred. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.31	Monocline, anticlinal bend (2nd option)—Identity and existence certain, location concealed. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.32	Monocline, anticlinal bend (2nd option)—Identity or existence questionable, location concealed. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.33	Monocline, synclinal bend (1st option)—Identity and existence certain, location accurate. Arrows show direction of dip; shorter arrow on steeper limb			Place fold trace where axial surface of synclinal bend of monocline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (synclinal bend of monocline); do not place at specific locality where observation was made. Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors.
5.9.34	Monocline, synclinal bend (1st option)—Identity or existence questionable, location accurate. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.35	Monocline, synclinal bend (1st option)—Identity and existence certain, location approximate. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.36	Monocline, synclinal bend (1st option)—Identity or existence questionable, location approximate. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.37	Monocline, synclinal bend (1st option)—Identity and existence certain, location inferred. Arrows show direction of dip; shorter arrow on steeper limb			Place fold trace where axial surface of synclinal bend of monocline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (synclinal bend of monocline); do not place at specific locality where observation was made. Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors.
5.9.38	Monocline, synclinal bend (1st option)—Identity or existence questionable, location inferred. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.39	Monocline, synclinal bend (1st option)—Identity and existence certain, location concealed. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.40	Monocline, synclinal bend (1st option)—Identity or existence questionable, location concealed. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.41	Monocline, synclinal bend (2nd option)—Identity and existence certain, location accurate. Arrows show direction of dip; shorter arrow on steeper limb			Place fold trace where axial surface of synclinal bend of monocline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (synclinal bend of monocline); do not place at specific locality where observation was made. Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors.
5.9.42	Monocline, synclinal bend (2nd option)—Identity or existence questionable, location accurate. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.43	Monocline, synclinal bend (2nd option)—Identity and existence certain, location approximate. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.44	Monocline, synclinal bend (2nd option)—Identity or existence questionable, location approximate. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.45	Monocline, synclinal bend (2nd option)—Identity and existence certain, location inferred. Arrows show direction of dip; shorter arrow on steeper limb			Place fold trace where axial surface of synclinal bend of monocline intersects the ground surface. Place arrows at places along fold trace to indicate overall fold type (synclinal bend of monocline); do not place at specific locality where observation was made. Arrowheads may be added to show direction of plunge (see Section 5.10). Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors.
5.9.46	Monocline, synclinal bend (2nd option)—Identity or existence questionable, location inferred. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.47	Monocline, synclinal bend (2nd option)—Identity and existence certain, location concealed. Arrows show direction of dip; shorter arrow on steeper limb			
5.9.48	Monocline, synclinal bend (2nd option)—Identity or existence questionable, location concealed. Arrows show direction of dip; shorter arrow on steeper limb			

5—FOLDS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.10—Line-symbol decorations and notations for folds				
5.10.1	Fold having inclined axial surface (1st option)—Tick shows dip value and direction		HI-6 (100% black)	Although only shown here on anticlines, line-symbol decorations and notations may be added to any type or style of fold. Add arrowhead or '90' to ticks showing dip if necessary for clarity. Place where observation was made.
5.10.2	Fold having inclined axial surface (2nd option)—Tick shows dip value and direction		HI-6 (100% black)	
5.10.3	Fold having vertical or near-vertical axial surface (1st option)			
5.10.4	Fold having vertical or near-vertical axial surface (2nd option)		HI-6 (100% black)	
5.10.5	Plunging anticline—Large arrowhead shows direction of plunge			Although only shown here on anticlines and synclines, line-symbol decorations and notations may be added to any type or style of fold. Place arrowhead(s) showing plunge at end(s) of, or along, any type or style of fold to indicate general plunge direction(s); do not add plunge angle.
5.10.6	Doubly plunging anticline			
5.10.7	Plunging syncline—Large arrowhead shows direction of plunge			
5.10.8	Doubly plunging syncline			
5.10.9	Fold having near-vertical fold limbs—Half-circle shows direction of closure			Although only shown here on anticlines and synclines, line-symbol decorations and notations may be added to any type or style of fold.
5.10.10	Crest line (CL) of fold where it diverges from axial surface of anticline		H-7	
5.10.11	Trough line (TL) of fold where it diverges from axial surface of syncline		H-7	
5.10.12	Fold—Showing name		H-8	

*For more information, see general guidelines on pages A-i to A-v.

5—FOLDS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.11—Small, minor folds				
5.11.1	Small, minor fold, horizontal axial surface		color 100% magenta circle diameter 3.0 mm; linewidth .2 mm crossbar linewidth .25 mm	Use when beds are too tightly folded to show traces of individual folds or when small, minor folds are observed in outcrop but cannot be traced away from that outcrop. Open-armed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors.
5.11.2	Small, minor dome		color 100% magenta 5.5 mm 40° linewidth .2 mm 1.475 mm	
5.11.3	Small, minor basin		color 100% magenta 5.5 mm 40° linewidth .2 mm 1.475 mm	
5.11.4	Small, minor anticline, vertical or near-vertical axial surface (1st option)—Showing strike		color 100% magenta 2.75 mm 6.0 mm 40° arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.5	Small, minor anticline, inclined axial surface (1st option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.6	Small, minor anticline, vertical or near-vertical axial surface (2nd option)—Showing strike		color 100% magenta 2.75 mm 6.0 mm 40° arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.7	Small, minor anticline, inclined axial surface (2nd option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.8	Small, minor antiform, vertical or near-vertical axial surface (1st option)—Showing strike		color 100% magenta 2.75 mm 6.0 mm 60° arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.9	Small, minor antiform, inclined axial surface (1st option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.10	Small, minor antiform, vertical or near-vertical axial surface (2nd option)—Showing strike		color 100% magenta 2.75 mm 6.0 mm 60° arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.11	Small, minor antiform, inclined axial surface (2nd option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.12	Small, minor asymmetric anticline, vertical or near-vertical axial surface (1st option)—Showing strike		color 100% magenta 2.25 mm 6.0 mm 40° arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.13	Small, minor asymmetric anticline, inclined axial surface (1st option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.14	Small, minor asymmetric anticline, vertical or near-vertical axial surface (2nd option)—Showing strike		color 100% magenta 2.25 mm 6.0 mm 40° arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.15	Small, minor asymmetric anticline, inclined axial surface (2nd option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.16	Small, minor overturned anticline, vertical or near-vertical axial surface (1st option)—Showing strike		color 100% magenta 2.275 mm 1.0 mm radius 40° arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.17	Small, minor overturned anticline, inclined axial surface (1st option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.18	Small, minor overturned anticline, vertical or near-vertical axial surface (2nd option)—Showing strike		color 100% magenta 2.275 mm 1.0 mm radius 40° arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.19	Small, minor overturned anticline, inclined axial surface (2nd option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.20	Small, minor inverted anticline, vertical or near-vertical axial surface (1st option)—Showing strike		color 100% magenta .875 mm radius 40° arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.21	Small, minor inverted anticline, inclined axial surface (1st option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.22	Small, minor inverted anticline, vertical or near-vertical axial surface (2nd option)—Showing strike		color 100% magenta .875 mm radius 40° arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.23	Small, minor inverted anticline, inclined axial surface (2nd option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	

*For more information, see general guidelines on pages A-i to A-v.

5—FOLDS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
5.11—Small, minor folds (continued)				
5.11.24	Small, minor syncline, vertical or near-vertical axial surface (1st option)—Showing strike		color 2.75 mm 100% magenta 6.0 mm 2.75 mm arrow linewidth .2 mm 1.475 mm linewidth .25 mm	Use when beds are too tightly folded to show traces of individual folds or when small, minor folds are observed in outcrop but cannot be traced away from that outcrop. Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular fold type. May also be shown in black or other colors.
5.11.25	Small, minor syncline, inclined axial surface (1st option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.26	Small, minor syncline, vertical or near-vertical axial surface (2nd option)—Showing strike		color 2.75 mm 100% magenta 6.0 mm 2.75 mm arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.27	Small, minor syncline, inclined axial surface (2nd option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.28	Small, minor synform, vertical or near-vertical axial surface (1st option)—Showing strike		color 2.75 mm 100% magenta 6.0 mm 2.75 mm arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.29	Small, minor synform, inclined axial surface (1st option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.30	Small, minor synform, vertical or near-vertical axial surface (2nd option)—Showing strike		color 2.75 mm 100% magenta 6.0 mm 2.75 mm arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.31	Small, minor synform, inclined axial surface (2nd option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.32	Small, minor asymmetric syncline, vertical or near-vertical axial surface (1st option)—Showing strike		color 2.25 mm 100% magenta 6.0 mm 3.5 mm arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.33	Small, minor asymmetric syncline, inclined axial surface (1st option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.34	Small, minor asymmetric syncline, vertical or near-vertical axial surface (2nd option)—Showing strike		color 2.25 mm 100% magenta 6.0 mm 3.5 mm arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.35	Small, minor asymmetric syncline, inclined axial surface (2nd option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.36	Small, minor overturned syncline, vertical or near-vertical axial surface (1st option)—Showing strike		color 2.275 mm 100% magenta 1.0 mm 6.0 mm radius arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.37	Small, minor overturned syncline, inclined axial surface (1st option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.38	Small, minor overturned syncline, vertical or near-vertical axial surface (2nd option)—Showing strike		color 2.275 mm 100% magenta 1.0 mm 6.0 mm radius arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.39	Small, minor overturned syncline, inclined axial surface (2nd option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.40	Small, minor inverted syncline, vertical or near-vertical axial surface (1st option)—Showing strike		color .875 mm 100% magenta 6.0 mm 2.25 mm radius arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.41	Small, minor inverted syncline, inclined axial surface (1st option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	
5.11.42	Small, minor inverted syncline, vertical or near-vertical axial surface (2nd option)—Showing strike		color .875 mm 100% magenta 6.0 mm 2.25 mm radius arrow linewidth .2 mm 1.475 mm linewidth .25 mm	
5.11.43	Small, minor inverted syncline, inclined axial surface (2nd option)—Showing strike and dip		HI-6 (100% black) 35 tick length 1.75 mm; linewidth .2 mm; color 100% magenta 9.0 mm	

*For more information, see general guidelines on pages A-i to A-v.

6—BEDDING

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
6.1	Horizontal bedding		all lineweights .2 mm circle diameter 2.5 mm	Inclined (upright) and overturned bedding symbols are used when the top direction of beds is known to a reasonable degree of certainty.
6.2	Inclined bedding—Showing strike and dip		1.0 mm 40 HI-6 5.0 mm all lineweights .2 mm	On maps where determination of top direction is "known" at some places and "unknown" at others, such symbols also may be used to indicate where top direction is "unknown" (compare with ref. nos. 6.14-24).
6.3	Vertical bedding—Showing strike		2.0 mm	Symbols may be used without a dip value to indicate the generalized strike and direction of dip of beds.
6.4	Overturned bedding—Showing strike and dip		1.0 mm 65 HI-6 .625 mm radius	For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line.
6.5	Bedding overturned more than 180 degrees—Showing strike and dip		.7 mm 20 .375 mm radius	For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding).
6.6	Inclined (dip direction to right) bedding, for multiple observations at one locality—Showing strike and dip		5.5 mm 40 HI-6 1.0 mm 1.325 mm	
6.7	Inclined (dip direction to left) bedding, for multiple observations at one locality—Showing strike and dip		40	
6.8	Vertical bedding, for multiple observations at one locality—Showing strike		2.0 mm	
6.9	Overturned (dip direction to right) bedding, for multiple observations at one locality—Showing strike and dip		.625 mm radius 65 HI-6 1.0 mm	
6.10	Overturned (dip direction to left) bedding, for multiple observations at one locality—Showing strike and dip		65	
6.11	Bedding overturned more than 180 degrees (dip direction to right), for multiple observations at one locality—Showing strike and dip		20 HI-6 .7 mm .375 mm radius	
6.12	Bedding overturned more than 180 degrees (dip direction to left), for multiple observations at one locality—Showing strike and dip		20	
6.13	Inclined bedding, where top direction of beds is known from local features—Showing strike and dip		1.0 mm 30 HI-6 5.0 mm all lineweights .2 mm dot diameter .75 mm	Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction.
6.14	Vertical bedding, where top direction of beds is known from local features—Showing strike. Ball shows top direction		2.0 mm	On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known" (compare with ref. nos. 6.1-13).
6.15	Overturned bedding, where top direction of beds is known from local features—Showing strike and dip		1.0 mm 85 HI-6 .625 mm radius	For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line.
6.16	Bedding overturned more than 180 degrees, where top direction of beds is known from local features—Showing strike and dip		10 HI-6 .7 mm .375 mm radius	For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding).
6.17	Inclined (dip direction to right) bedding, where top direction of beds is known from local features, for multiple observations at one locality—Showing strike and dip		5.5 mm 30 HI-6 1.0 mm 1.325 mm	
6.18	Inclined (dip direction to left) bedding, where top direction of beds is known from local features, for multiple observations at one locality—Showing strike and dip		30	
6.19	Vertical (top direction to right) bedding, where top direction of beds is known from local features, for multiple observations at one locality—Showing strike. Ball shows top direction		2.0 mm	
6.20	Vertical (top direction to left) bedding, where top direction of beds is known from local features, for multiple observations at one locality—Showing strike. Ball shows top direction			
6.21	Overturned (dip direction to right) bedding, where top direction of beds is known from local features, for multiple observations at one locality—Showing strike and dip		.625 mm radius 85 HI-6 1.0 mm 1.7 mm	
6.22	Overturned (dip direction to left) bedding, where top direction of beds is known from local features, for multiple observations at one locality—Showing strike and dip		85	
6.23	Bedding overturned more than 180 degrees (dip direction to right), where top direction of beds is known from local features, for multiple observations at one locality—Showing strike and dip		10 HI-6 .7 mm .375 mm radius 1.325 mm	
6.24	Bedding overturned more than 180 degrees (dip direction to left), where top direction of beds is known from local features, for multiple observations at one locality—Showing strike and dip		10	

*For more information, see general guidelines on pages A-i to A-v.

6—BEDDING (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
6.25	Inclined crenulated, warped, undulatory, or contorted bedding—Showing approximate strike and dip			Symbols may be used without a dip value to indicate the generalized strike and direction of dip of beds.
6.26	Vertical or near-vertical crenulated, warped, undulatory, or contorted bedding—Showing approximate strike			
6.27	Inclined graded bedding—Showing strike and dip			
6.28	Vertical or near-vertical graded bedding—Showing strike			
6.29	Overtuned graded bedding—Showing strike and dip			
6.30	Inclined bedding in crossbedded rocks—Showing approximate strike and dip			
6.31	Vertical or near-vertical bedding in crossbedded rocks—Showing approximate strike			Use when the measurement of strike and (or) dip value is approximate but the location of observation is accurate. Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction. On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known".
6.32	Overtuned bedding in crossbedded rocks—Showing approximate strike and dip			
6.33	Approximate orientation of inclined bedding—Showing approximate strike and dip			
6.34	Approximate orientation of vertical or near-vertical bedding—Showing approximate strike			
6.35	Approximate orientation of overtuned bedding—Showing approximate strike and dip			
6.36	Approximate orientation of inclined bedding, where top direction of beds is known from local features—Showing approximate strike and dip			Usually reserved for use in reconnaissance geologic mapping.
6.37	Approximate orientation of vertical or near-vertical bedding, where top direction of beds is known from local features—Showing approximate strike			
6.38	Approximate orientation of overtuned bedding, where top direction of beds is known from local features—Showing approximate strike and dip			
6.39	Horizontal bedding, as determined remotely or from aerial photographs			
6.40	Gently inclined (between 0° and 30°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip			
6.41	Moderately inclined (between 30° and 60°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip			
6.42	Steeply inclined (between 60° and 90°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip			
6.43	Vertical or near-vertical bedding, as determined remotely or from aerial photographs—Showing approximate strike			
6.44	Gently overtuned (between 0° and 30°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip			
6.45	Moderately overtuned (between 30° and 60°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip			
6.46	Steeply overtuned (between 60° and 90°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip			

*For more information, see general guidelines on pages A-i to A-v.

7—CLEAVAGE

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
7.1	Horizontal cleavage (generic or type unspecified)			For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line. For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding).
7.2	Inclined cleavage (generic or type unspecified)—Showing strike and dip			
7.3	Vertical cleavage (generic or type unspecified)—Showing strike			
7.4	Inclined (dip direction to right) cleavage (generic or type unspecified), for multiple observations at one locality—Showing strike and dip			
7.5	Inclined (dip direction to left) cleavage (generic or type unspecified), for multiple observations at one locality—Showing strike and dip			
7.6	Vertical cleavage (generic or type unspecified), for multiple observations at one locality—Showing strike			
7.7	Horizontal continuous slaty cleavage			
7.8	Inclined continuous slaty cleavage—Showing strike and dip			
7.9	Vertical continuous slaty cleavage—Showing strike			
7.10	Inclined (dip direction to right) continuous slaty cleavage, for multiple observations at one locality—Showing strike and dip			
7.11	Inclined (dip direction to left) continuous slaty cleavage, for multiple observations at one locality—Showing strike and dip			
7.12	Vertical continuous slaty cleavage, for multiple observations at one locality—Showing strike			
7.13	Horizontal disjunctive spaced cleavage			
7.14	Inclined disjunctive spaced cleavage—Showing strike and dip			
7.15	Vertical disjunctive spaced cleavage—Showing strike			
7.16	Inclined (dip direction to right) disjunctive spaced cleavage, for multiple observations at one locality—Showing strike and dip			
7.17	Inclined (dip direction to left) disjunctive spaced cleavage, for multiple observations at one locality—Showing strike and dip			
7.18	Vertical disjunctive spaced cleavage, for multiple observations at one locality—Showing strike			
7.19	Horizontal disjunctive, symmetric crenulation cleavage			
7.20	Inclined disjunctive, symmetric crenulation cleavage—Showing strike and dip			
7.21	Vertical or near-vertical disjunctive, symmetric crenulation cleavage—Showing strike			
7.22	Inclined (dip direction to right) disjunctive, symmetric crenulation cleavage, for multiple observations at one locality—Showing strike and dip			
7.23	Inclined (dip direction to left) disjunctive, symmetric crenulation cleavage, for multiple observations at one locality—Showing strike and dip			
7.24	Vertical or near-vertical disjunctive, symmetric crenulation cleavage, for multiple observations at one locality—Showing strike			

*For more information, see general guidelines on pages A-i to A-v.

7—CLEAVAGE (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
7.25	Horizontal disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation cleavage			For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line. For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding).
7.26	Inclined disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation cleavage—Showing strike and dip			
7.27	Vertical or near-vertical disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation cleavage—Showing strike			
7.28	Inclined (dip direction to right) disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation cleavage, for multiple observations at one locality—Showing strike and dip			
7.29	Inclined (dip direction to left) disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation cleavage, for multiple observations at one locality—Showing strike and dip			
7.30	Vertical or near-vertical disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation cleavage, for multiple observations at one locality—Showing strike			
7.31	Horizontal disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation cleavage			
7.32	Inclined disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation cleavage—Showing strike and dip			
7.33	Vertical or near-vertical disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation cleavage—Showing strike			
7.34	Inclined (dip direction to right) disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation cleavage, for multiple observations at one locality—Showing strike and dip			
7.35	Inclined (dip direction to left) disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation cleavage, for multiple observations at one locality—Showing strike and dip			
7.36	Vertical or near-vertical disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation cleavage, for multiple observations at one locality—Showing strike			

*For more information, see general guidelines on pages A-i to A-v.

8—FOLIATION

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
8.1—Generic foliation (origin not known or not specified)				
8.1.1	Horizontal generic (origin not known or not specified) foliation		all lineweights .2 mm 1.5 mm 90° circle diameter 2.5 mm	For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line.
8.1.2	Inclined generic (origin not known or not specified) foliation—Showing strike and dip		1.0 mm 55° 5.0 mm all lineweights .2 mm HI-6	For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding).
8.1.3	Vertical generic (origin not known or not specified) foliation—Showing strike		2.0 mm	
8.1.4	Inclined (dip direction to right) generic (origin not known or not specified) foliation, for multiple observations at one locality—Showing strike and dip		5.5 mm 55° 1.0 mm 90° HI-6	
8.1.5	Inclined (dip direction to left) generic (origin not known or not specified) foliation, for multiple observations at one locality—Showing strike and dip		55°	
8.1.6	Vertical generic (origin not known or not specified) foliation or foliation, for multiple observations at one locality—Showing strike		2.0 mm	
8.2—Primary foliation or layering (in igneous rocks)				
8.2.1	Massive igneous rock		dot diameter .35 mm 2.0 mm 90°	May be used at locality where foliation and lineation are absent.
8.2.2	Horizontal flow banding, lamination, or foliation in igneous rock		all lineweights .2 mm 60° circle diameter 2.5 mm	For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line.
8.2.3	Inclined flow banding, lamination, or foliation in igneous rock—Showing strike and dip		1.0 mm 10° 5.0 mm all lineweights .2 mm HI-6	For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding).
8.2.4	Vertical flow banding, lamination, or foliation in igneous rock—Showing strike		2.0 mm	
8.2.5	Inclined (dip direction to right) flow banding, lamination, or foliation in igneous rock, for multiple observations at one locality—Showing strike and dip		5.5 mm 10° 1.0 mm 60° HI-6	
8.2.6	Inclined (dip direction to left) flow banding, lamination, or foliation in igneous rock, for multiple observations at one locality—Showing strike and dip		10°	
8.2.7	Vertical flow banding, lamination, or foliation in igneous rock, for multiple observations at one locality—Showing strike		2.0 mm	
8.2.8	Inclined crinkled or deformed flow banding, lamination, or foliation in igneous rock—Showing approximate strike and dip		1.0 mm 20° all lineweights .2 mm 375 mm 5.0 mm .75 mm radius	
8.2.9	Vertical or near-vertical crinkled or deformed flow banding, lamination, or foliation in igneous rock—Showing approximate strike		2.0 mm	
8.2.10	Horizontal cumulate foliation		all lineweights .2 mm circle diameter 2.5 mm 5 mm	Inclined (upright) and overturned cumulate foliation symbols are used when the top direction of layers is known to a reasonable degree of certainty.
8.2.11	Inclined cumulate foliation—Showing strike and dip		all lineweights .2 mm 1.0 mm 45° HI-6 5 mm	
8.2.12	Vertical cumulate foliation—Showing strike		2.5 mm	Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction. On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known".
8.2.13	Overturned cumulate foliation—Showing strike and dip		1.0 mm 70° HI-6 .625 mm radius	
8.2.14	Inclined cumulate foliation, where top direction of layers is known from local features—Showing strike and dip		all lineweights .2 mm 30° 5 mm 1.0 mm 5.0 mm dot diameter .75 mm	
8.2.15	Vertical cumulate foliation, where top direction of layers is known from local features—Showing strike. Ball shows top direction		2.5 mm	
8.2.16	Overturned cumulate foliation, where top direction of layers is known from local features—Showing strike and dip		1.0 mm 80° HI-6 .625 mm radius	

*For more information, see general guidelines on pages A-i to A-v.

8—FOLIATION (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
8.2—Primary foliation or layering (in igneous rocks) (continued)				
8.2.17	Inclined crinkled or deformed cumulate foliation—Showing approximate strike and dip			For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line. For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding).
8.2.18	Vertical or near-vertical crinkled or deformed cumulate foliation—Showing approximate strike			
8.2.19	Horizontal eutaxitic foliation			
8.2.20	Inclined eutaxitic foliation—Showing strike and dip			
8.2.21	Vertical or near-vertical eutaxitic foliation—Showing strike			
8.2.22	Inclined (dip direction to right) eutaxitic foliation, for multiple observations at one locality—Showing strike and dip			
8.2.23	Inclined (dip direction to left) eutaxitic foliation, for multiple observations at one locality—Showing strike and dip			
8.2.24	Vertical or near-vertical eutaxitic foliation, for multiple observations at one locality—Showing strike			
8.2.25	Inclined crinkled or deformed eutaxitic foliation—Showing approximate strike and dip			
8.2.26	Vertical or near-vertical crinkled or deformed eutaxitic foliation—Showing approximate strike			

*For more information, see general guidelines on pages A-i to A-v.

8—FOLIATION (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
8.3—Secondary foliation (caused by metamorphism or tectonism)				
8.3.1	Horizontal metamorphic or tectonic foliation		circle diameter 2.5 mm lineweight .2 mm	For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line. For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding).
8.3.2	Inclined metamorphic or tectonic foliation—Showing strike and dip		1.0 mm 60° 35 5.0 mm lineweight .2 mm	
8.3.3	Vertical metamorphic or tectonic foliation—Showing strike		2.0 mm	
8.3.4	Inclined (dip direction to right) metamorphic or tectonic foliation, for multiple observations at one locality—Showing strike and dip		5.5 mm 35 HI-6 1.0 mm 60°	Inclined (upright) and overturned foliation symbols are used when the top direction of bedding is known to a reasonable degree of certainty. Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction. On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known".
8.3.5	Inclined (dip direction to left) metamorphic or tectonic foliation, for multiple observations at one locality—Showing strike and dip		35	
8.3.6	Vertical metamorphic or tectonic foliation, for multiple observations at one locality—Showing strike		2.0 mm	
8.3.7	Horizontal metamorphic or tectonic foliation parallel to bedding		circle diameter 2.5 mm all lineweights .2 mm	Inclined (upright) and overturned foliation symbols are used when the top direction of bedding is known to a reasonable degree of certainty. Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction. On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known".
8.3.8	Inclined metamorphic or tectonic foliation parallel to bedding—Showing strike and dip		1.0 mm 10 60° HI-6 1.0 mm 5.0 mm all lineweights .2 mm	
8.3.9	Vertical metamorphic or tectonic foliation parallel to bedding—Showing strike		4.0 mm 2.0 mm	
8.3.10	Inclined metamorphic or tectonic foliation parallel to overturned bedding—Showing strike and dip		75 HI-6 .625 mm radius	Inclined (upright) and overturned foliation symbols are used when the top direction of bedding is known to a reasonable degree of certainty. Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction. On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known".
8.3.11	Inclined metamorphic or tectonic foliation parallel to upright bedding, where top direction of beds is known from local features—Showing strike and dip		1.0 mm 15 60° HI-6 1.0 mm 5.0 mm dot diameter .75 mm all lineweights .2 mm	
8.3.12	Vertical metamorphic or tectonic foliation parallel to bedding, where top direction of beds is known from local features—Showing strike. Ball shows top direction		4.0 mm 2.0 mm	
8.3.13	Inclined metamorphic or tectonic foliation parallel to overturned bedding, where top direction of beds is known from local features—Showing strike and dip		85 HI-6 .625 mm radius	Inclined (upright) and overturned foliation symbols are used when the top direction of bedding is known to a reasonable degree of certainty. Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction. On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known".
8.3.14	Inclined crinkled or deformed metamorphic or tectonic foliation—Showing approximate strike and dip		30 HI-6 1.0 mm lineweight .2 mm 5.0 mm .375 mm .75 mm radius	
8.3.15	Vertical or near-vertical crinkled or deformed metamorphic or tectonic foliation—Showing approximate strike		2.0 mm	
8.3.16	Horizontal continuous, penetrative foliation		1.0 mm 60° 5 mm circle diameter 2.5 mm all lineweights .2 mm 4.25 mm	For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line. For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding).
8.3.17	Inclined continuous, penetrative foliation—Showing strike and dip		1.0 mm 25 60° HI-6 1.0 mm 5.0 mm all lineweights .2 mm	
8.3.18	Vertical continuous, penetrative foliation—Showing strike		2.0 mm	
8.3.19	Inclined (dip direction to right) continuous, penetrative foliation, for multiple observations at one locality—Showing strike and dip		5.5 mm 25 HI-6 1.0 mm 5 mm 1.0 mm 60°	Inclined (upright) and overturned foliation symbols are used when the top direction of bedding is known to a reasonable degree of certainty. Symbols that have a ball may be used to indicate a greater level of certainty in the determination of top direction. On maps where determination of top direction is "known" at some places and "unknown" at others, symbols that have a ball also may be used to indicate where top direction is "known".
8.3.20	Inclined (dip direction to left) continuous, penetrative foliation, for multiple observations at one locality—Showing strike and dip		25	
8.3.21	Vertical continuous, penetrative foliation, for multiple observations at one locality—Showing strike		2.0 mm	

*For more information, see general guidelines on pages A-i to A-v.

8—FOLIATION (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
8.3—Secondary foliation (caused by metamorphism or tectonism) (continued)				
8.3.22	Horizontal disjunctive, spaced foliation		circle diameter 2.5 mm all lineweights .2 mm HI-6 1.0 mm 3.6 mm	For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line. For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding).
8.3.23	Inclined disjunctive, spaced foliation—Showing strike and dip		HI-6 1.0 mm 5.0 mm 1.0 mm	
8.3.24	Vertical disjunctive, spaced foliation—Showing strike		2.0 mm	
8.3.25	Inclined (dip direction to right) disjunctive, spaced foliation, for multiple observations at one locality—Showing strike and dip		5.5 mm HI-6 1.0 mm 1.0 mm 60°	
8.3.26	Inclined (dip direction to left) disjunctive, spaced foliation, for multiple observations at one locality—Showing strike and dip		30	
8.3.27	Vertical disjunctive, spaced foliation, for multiple observations at one locality—Showing strike		2.0 mm	
8.3.28	Horizontal disjunctive, symmetric crenulation foliation		circle diameter 2.5 mm all lineweights .2 mm draft as shown	
8.3.29	Inclined disjunctive, symmetric crenulation foliation—Showing strike and dip		HI-6 1.0 mm 5.0 mm 1.0 mm	
8.3.30	Vertical or near-vertical disjunctive, symmetric crenulation foliation—Showing strike		2.0 mm	
8.3.31	Inclined (dip direction to right) disjunctive, symmetric crenulation foliation, for multiple observations at one locality—Showing strike and dip		5.5 mm HI-6 1.0 mm 1.0 mm 60° draft as shown	
8.3.32	Inclined (dip direction to left) disjunctive, symmetric crenulation foliation, for multiple observations at one locality—Showing strike and dip		35	
8.3.33	Vertical or near-vertical disjunctive, symmetric crenulation foliation, for multiple observations at one locality—Showing strike		2.0 mm	
8.3.34	Horizontal disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation foliation		circle diameter 2.5 mm all lineweights .2 mm draft as shown	
8.3.35	Inclined disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation foliation—Showing strike and dip		HI-6 1.0 mm 5.0 mm 1.0 mm draft as shown	
8.3.36	Vertical or near-vertical disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation foliation—Showing strike		2.0 mm	
8.3.37	Inclined (dip direction to right) disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation foliation, for multiple observations at one locality—Showing strike and dip		5.5 mm HI-6 1.0 mm 1.0 mm 60° draft as shown	
8.3.38	Inclined (dip direction to left) disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation foliation, for multiple observations at one locality—Showing strike and dip		40	
8.3.39	Vertical or near-vertical disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation foliation, for multiple observations at one locality—Showing strike		2.0 mm	
8.3.40	Horizontal disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation foliation		circle diameter 2.5 mm all lineweights .2 mm draft as shown	
8.3.41	Inclined disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation foliation—Showing strike and dip		HI-6 1.0 mm 5.0 mm 1.0 mm draft as shown	
8.3.42	Vertical or near-vertical disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation foliation—Showing strike		2.0 mm	
8.3.43	Inclined (dip direction to right) disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation foliation, for multiple observations at one locality—Showing strike and dip		5.5 mm HI-6 1.0 mm 1.0 mm 60° draft as shown	
8.3.44	Inclined (dip direction to left) disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation foliation, for multiple observations at one locality—Showing strike and dip		45	
8.3.45	Vertical or near-vertical disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation foliation, for multiple observations at one locality—Showing strike		2.0 mm	

8—FOLIATION (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
8.3—Secondary foliation (caused by metamorphism or tectonism) (continued)				
8.3.46	Horizontal gneissic layering		circle diameter 2.5 mm all lineweights .2 mm 	For symbols representing a single observation at one locality, point of observation is the mid-point of the strike line. For multiple observations at one locality, join symbols at the "tail" ends of the strike lines (opposite the ornamentation); the junction point is at point of observation. To obey the right-hand rule, use the "dip direction to right" symbols (use "dip direction to left" symbols only when necessary to prevent overcrowding).
8.3.47	Inclined gneissic layering—Showing strike and dip			
8.3.48	Vertical or near-vertical gneissic layering—Showing strike			
8.3.49	Inclined (dip direction to right) gneissic layering, for multiple observations at one locality—Showing strike and dip			
8.3.50	Inclined (dip direction to left) gneissic layering, for multiple observations at one locality—Showing strike and dip			
8.3.51	Vertical or near-vertical gneissic layering, for multiple observations at one locality—Showing strike			
8.3.52	Horizontal undulatory gneissic layering		circle diameter 2.5 mm all lineweights .2 mm 	
8.3.53	Inclined undulatory gneissic layering—Showing strike and dip			
8.3.54	Vertical or near-vertical undulatory gneissic layering—Showing strike			
8.3.55	Horizontal mylonitic foliation		circle diameter 2.5 mm all lineweights .2 mm 	
8.3.56	Inclined mylonitic foliation—Showing strike and dip			
8.3.57	Vertical or near-vertical mylonitic foliation—Showing strike			
8.3.58	Inclined (dip direction to right) mylonitic foliation, for multiple observations at one locality—Showing strike and dip			
8.3.59	Inclined (dip direction to left) mylonitic foliation, for multiple observations at one locality—Showing strike and dip			
8.3.60	Vertical or near-vertical mylonitic foliation, for multiple observations at one locality—Showing strike			


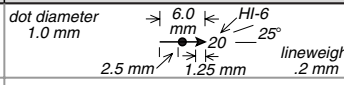

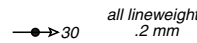

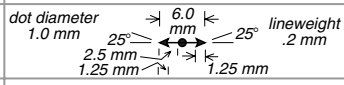

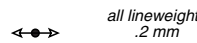

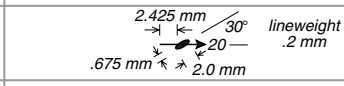

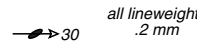

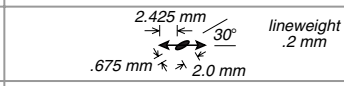

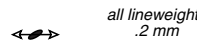

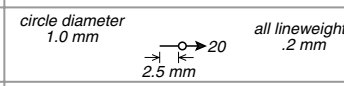



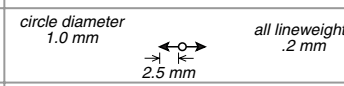



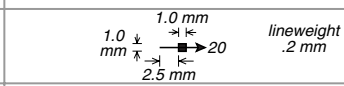

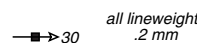

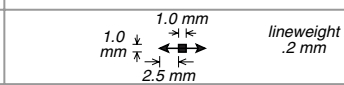

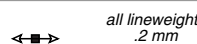

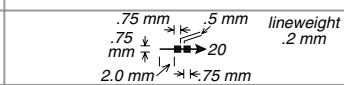

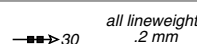

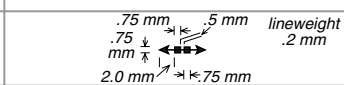

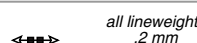

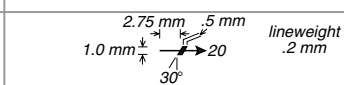

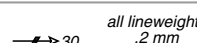

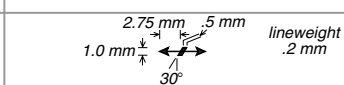

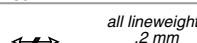
*For more information, see general guidelines on pages A-i to A-v.

9—LINEATION

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
9.1	Approximate plunge direction of inclined generic (origin or type not known or not specified) lineation or linear structure (1st option)		<i>lineweight</i> .2 mm 	Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular lineation. Lineation symbols may be used separately or combined with other symbols.
9.2	Approximate plunge direction of inclined generic (origin or type not known or not specified) lineation or linear structure (2nd option)		<i>all lineweights</i> .2 mm 	
9.3	Inclined generic (origin or type not known or not specified) lineation or linear structure (1st option)—Showing bearing and plunge			
9.4	Inclined generic (origin or type not known or not specified) lineation or linear structure (2nd option)—Showing bearing and plunge			
9.5	Horizontal generic (origin or type not known or not specified) lineation or linear structure (1st option)—Showing bearing		<i>lineweight</i> .2 mm 	For lineation symbols representing a single observation at one locality, the point of observation is at one of the following two places: for inclined lineations, at the "tail" end (opposite the arrowhead); for horizontal lineations, at the midpoint of the bearing line. For a single lineation symbol combined with a single planar-feature (for example, bedding or foliation) symbol, join the "tail" end of the lineation arrow to the midpoint of the strike line of the planar-feature symbol; the junction point is at the point of observation.
9.6	Horizontal generic (origin or type not known or not specified) lineation or linear structure (2nd option)—Showing bearing		<i>all lineweights</i> .2 mm 	
9.7	Vertical or near-vertical generic (origin or type not known or not specified) lineation or linear structure (1st option)		<i>all lineweights</i> .2 mm 	
9.8	Vertical or near-vertical generic (origin or type not known or not specified) lineation or linear structure (2nd option)			
9.9	Inclined parting lineation in sedimentary materials (1st option)—Showing bearing and plunge		<i>all lineweights</i> .2 mm 	For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation.
9.10	Inclined parting lineation in sedimentary materials (2nd option)—Showing bearing and plunge			
9.11	Horizontal parting lineation in sedimentary materials (1st option)—Showing bearing		<i>all lineweights</i> .2 mm 	
9.12	Horizontal parting lineation in sedimentary materials (2nd option)—Showing bearing			
9.13	Inclined sole mark, tool mark, scour mark, flute mark, groove, or channel in sedimentary materials (1st option)—Showing bearing and plunge		<i>lineweight</i> .2 mm 	For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation.
9.14	Inclined sole mark, tool mark, scour mark, flute mark, groove, or channel in sedimentary materials (2nd option)—Showing bearing and plunge		<i>all lineweights</i> .2 mm 	
9.15	Horizontal sole mark, tool mark, scour mark, flute mark, groove, or channel in sedimentary materials (1st option)—Showing bearing		<i>lineweight</i> .2 mm 	
9.16	Horizontal sole mark, tool mark, scour mark, flute mark, groove, or channel in sedimentary materials (2nd option)—Showing bearing		<i>all lineweights</i> .2 mm 	
9.17	Inclined slickenline, groove, or striation on fault surface (1st option)—Showing bearing and plunge		<i>lineweight</i> .2 mm 	For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation.
9.18	Inclined slickenline, groove, or striation on fault surface (2nd option)—Showing bearing and plunge		<i>all lineweights</i> .2 mm 	
9.19	Horizontal slickenline, groove, or striation on fault surface (1st option)—Showing bearing		<i>lineweight</i> .2 mm 	
9.20	Horizontal slickenline, groove, or striation on fault surface (2nd option)—Showing bearing		<i>all lineweights</i> .2 mm 	
9.21	Inclined surface groove or striation (origin not known or not specified) (1st option)—Showing bearing and plunge		<i>all lineweights</i> .2 mm 	For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation.
9.22	Inclined surface groove or striation (origin not known or not specified) (2nd option)—Showing bearing and plunge			
9.23	Horizontal surface groove or striation (origin not known or not specified) (1st option)—Showing bearing		<i>all lineweights</i> .2 mm 	
9.24	Horizontal surface groove or striation (origin not known or not specified) (2nd option)—Showing bearing			


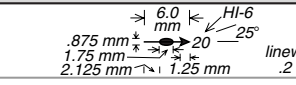

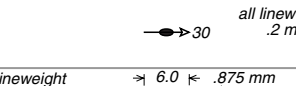

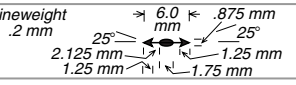

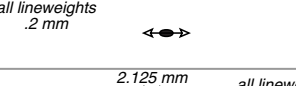

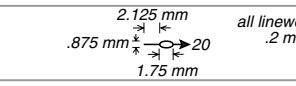

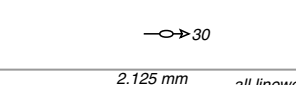

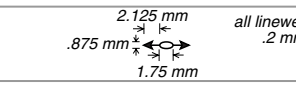

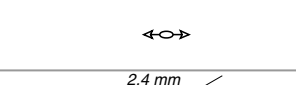

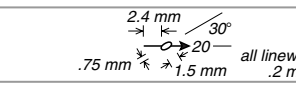

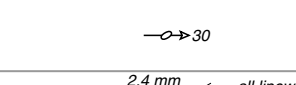

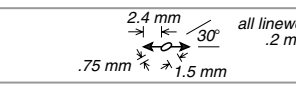

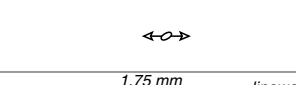

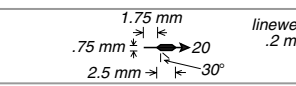

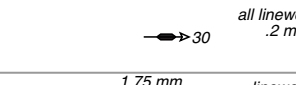

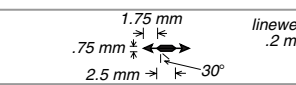

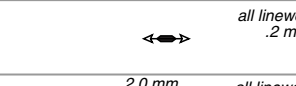

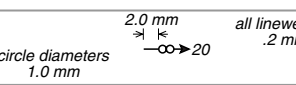

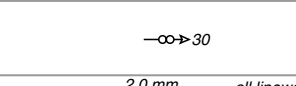

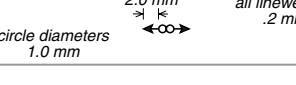

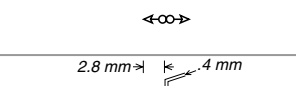

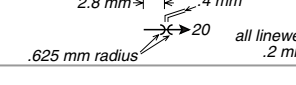

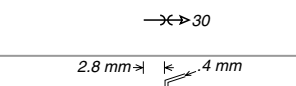

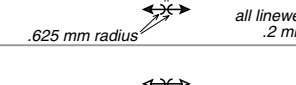

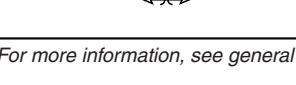
*For more information, see general guidelines on pages A-i to A-v.

9— LINEATION (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
9.25	Inclined aligned-object lineation (1st option)— Showing bearing and plunge			Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular lineation. Lineation symbols may be used separately or combined with other symbols.
9.26	Inclined aligned-object lineation (2nd option)— Showing bearing and plunge			
9.27	Horizontal aligned-object lineation (1st option)— Showing bearing			
9.28	Horizontal aligned-object lineation (2nd option)— Showing bearing			
9.29	Inclined aligned-clast or aligned-grain lineation (in sedimentary materials) (1st option)—Showing bearing and plunge			For lineation symbols representing a single observation at one locality, the point of observation is at one of the following two places: for inclined lineations, at the "tail" end (opposite the arrow-head); for horizontal lineations, at the midpoint of the bearing line. For a single lineation symbol combined with a single planar-feature (for example, bedding or foliation) symbol, join the "tail" end of the lineation arrow to the midpoint of the strike line of the planar-feature symbol; the junction point is at the point of observation.
9.30	Inclined aligned-clast or aligned-grain lineation (in sedimentary materials) (2nd option)—Showing bearing and plunge			
9.31	Horizontal aligned-clast or aligned-grain lineation (in sedimentary materials) (1st option)—Showing bearing			
9.32	Horizontal aligned-clast or aligned-grain lineation (in sedimentary materials) (2nd option)—Showing bearing			
9.33	Inclined aligned-inclusion lineation (in igneous rocks) (1st option)—Showing bearing and plunge			For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation.
9.34	Inclined aligned-inclusion lineation (in igneous rocks) (2nd option)—Showing bearing and plunge			
9.35	Horizontal aligned-inclusion lineation (in igneous rocks) (1st option)—Showing bearing			
9.36	Horizontal aligned-inclusion lineation (in igneous rocks) (2nd option)—Showing bearing			
9.37	Inclined aligned-mineral lineation (1st option)— Showing bearing and plunge			
9.38	Inclined aligned-mineral lineation (2nd option)— Showing bearing and plunge			
9.39	Horizontal aligned-mineral lineation (1st option)— Showing bearing			
9.40	Horizontal aligned-mineral lineation (2nd option)— Showing bearing			
9.41	Inclined aligned mineral-aggregate lineation (1st option)—Showing bearing and plunge			
9.42	Inclined aligned mineral-aggregate lineation (2nd option)—Showing bearing and plunge			
9.43	Horizontal aligned mineral-aggregate lineation (1st option)—Showing bearing			
9.44	Horizontal aligned mineral-aggregate lineation (2nd option)—Showing bearing			
9.45	Inclined aligned deformed-mineral lineation (1st op- tion)—Showing bearing and plunge			
9.46	Inclined aligned deformed-mineral lineation (2nd option)—Showing bearing and plunge			
9.47	Horizontal aligned deformed-mineral lineation (1st option)—Showing bearing			
9.48	Horizontal aligned deformed-mineral lineation (2nd option)—Showing bearing			


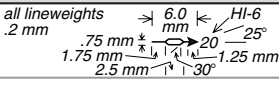



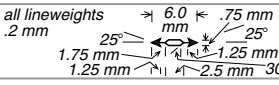



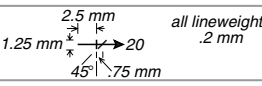



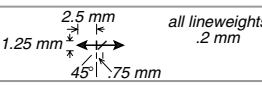



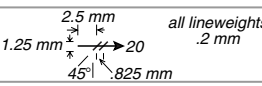



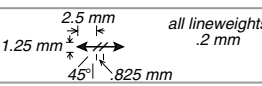



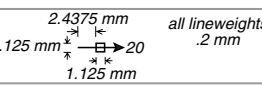



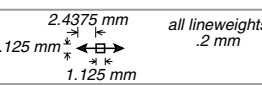



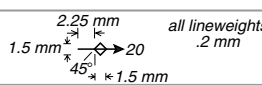



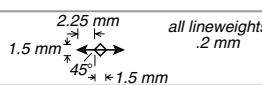



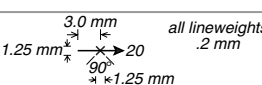



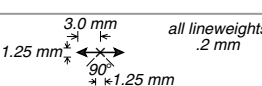


*For more information, see general guidelines on pages A-i to A-v.

9—LINEATION (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
9.49	Inclined aligned stretched-object lineation (1st option)—Showing bearing and plunge			Open-arrow ("2nd option") symbols may be used to show a second generation or another instance of a particular lineation.
9.50	Inclined aligned stretched-object lineation (2nd option)—Showing bearing and plunge			
9.51	Horizontal aligned stretched-object lineation (1st option)—Showing bearing			Lineation symbols may be used separately or combined with other symbols.
9.52	Horizontal aligned stretched-object lineation (2nd option)—Showing bearing			
9.53	Inclined aligned stretched-pebble lineation (1st option)—Showing bearing and plunge			For lineation symbols representing a single observation at one locality, the point of observation is at one of the following two places: for inclined lineations, at the "tail" end (opposite the arrow-head); for horizontal lineations, at the midpoint of the bearing line.
9.54	Inclined aligned stretched-pebble lineation (2nd option)—Showing bearing and plunge			
9.55	Horizontal aligned stretched-pebble lineation (1st option)—Showing bearing			For a single lineation symbol combined with a single planar-feature (for example, bedding or foliation) symbol, join the "tail" end of the lineation arrow to the midpoint of the strike line of the planar-feature symbol; the junction point is at the point of observation.
9.56	Horizontal aligned stretched-pebble lineation (2nd option)—Showing bearing			
9.57	Inclined aligned stretched-oid lineation (1st option)—Showing bearing and plunge			For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation.
9.58	Inclined aligned stretched-oid lineation (2nd option)—Showing bearing and plunge			
9.59	Horizontal aligned stretched-oid lineation (1st option)—Showing bearing			
9.60	Horizontal aligned stretched-oid lineation (2nd option)—Showing bearing			
9.61	Inclined rodding (1st option)—Showing bearing and plunge			
9.62	Inclined rodding (2nd option)—Showing bearing and plunge			
9.63	Horizontal rodding (1st option)—Showing bearing			
9.64	Horizontal rodding (2nd option)—Showing bearing			
9.65	Inclined mullions (1st option)—Showing bearing and plunge			
9.66	Inclined mullions (2nd option)—Showing bearing and plunge			
9.67	Horizontal mullions (1st option)—Showing bearing			
9.68	Horizontal mullions (2nd option)—Showing bearing			
9.69	Inclined boudins (1st option)—Showing bearing and plunge			
9.70	Inclined boudins (2nd option)—Showing bearing and plunge			
9.71	Horizontal boudins (1st option)—Showing bearing			
9.72	Horizontal boudins (2nd option)—Showing bearing			

*For more information, see general guidelines on pages A-i to A-v.

9—LINEATION (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
9.73	Inclined pencil structure (1st option)—Showing bearing and plunge			Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular lineation.
9.74	Inclined pencil structure (2nd option)—Showing bearing and plunge			
9.75	Horizontal pencil structure (1st option)—Showing bearing			
9.76	Horizontal pencil structure (2nd option)—Showing bearing			
9.77	Inclined lineation at intersection of bedding and cleavage (1st option)—Showing bearing and plunge			Lineation symbols may be used separately or combined with other symbols.
9.78	Inclined lineation at intersection of bedding and cleavage (2nd option)—Showing bearing and plunge			
9.79	Horizontal lineation at intersection of bedding and cleavage (1st option)—Showing bearing			
9.80	Horizontal lineation at intersection of bedding and cleavage (2nd option)—Showing bearing			
9.81	Inclined lineation at intersection of two cleavages (1st option)—Showing bearing and plunge			For lineation symbols representing a single observation at one locality, the point of observation is at one of the following two places: for inclined lineations, at the "tail" end (opposite the arrow-head); for horizontal lineations, at the midpoint of the bearing line.
9.82	Inclined lineation at intersection of two cleavages (2nd option)—Showing bearing and plunge			
9.83	Horizontal lineation at intersection of two cleavages (1st option)—Showing bearing			
9.84	Horizontal lineation at intersection of two cleavages (2nd option)—Showing bearing			
9.85	Inclined lineation at intersection of two fractures or joints (1st option)—Showing bearing and plunge			For a single lineation symbol combined with a single planar-feature (for example, bedding or foliation) symbol, join the "tail" end of the lineation arrow to the midpoint of the strike line of the planar-feature symbol; the junction point is at the point of observation.
9.86	Inclined lineation at intersection of two fractures or joints (2nd option)—Showing bearing and plunge			
9.87	Horizontal lineation at intersection of two fractures or joints (1st option)—Showing bearing			
9.88	Horizontal lineation at intersection of two fractures or joints (2nd option)—Showing bearing			
9.89	Inclined lineation at intersection of two foliations (1st option)—Showing bearing and plunge			For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation.
9.90	Inclined lineation at intersection of two foliations (2nd option)—Showing bearing and plunge			
9.91	Horizontal lineation at intersection of two foliations (1st option)—Showing bearing			
9.92	Horizontal lineation at intersection of two foliations (2nd option)—Showing bearing			
9.93	Inclined lineation at intersection of two surfaces (origin or type unspecified) (1st option)—Showing bearing and plunge			
9.94	Inclined lineation at intersection of two surfaces (origin or type unspecified) (2nd option)—Showing bearing and plunge			
9.95	Horizontal lineation at intersection of two surfaces (origin or type unspecified) (1st option)—Showing bearing			
9.96	Horizontal lineation at intersection of two surfaces (origin or type unspecified) (2nd option)—Showing bearing			

*For more information, see general guidelines on pages A-i to A-v.

9—LINEATION (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
9.97	Inclined fold hinge of generic (type or orientation unspecified) small, minor fold (1st option)—Showing bearing and plunge		dot diameter .5 mm color 100% magenta 2.75 mm 6.0 mm HI-6 (100% black) 20° 1.25 mm lineweight .2 mm	Open-arrowed ("2nd option") symbols may be used separately or combined with other symbols. For lineation symbols representing a single observation at one locality, the point of observation is at one of the following two places: for inclined lineations, at the "tail" end (opposite the arrow-head); for horizontal lineations, at the midpoint of the bearing line. For a single lineation symbol combined with a single planar-feature (for example, bedding or foliation) symbol, join the "tail" end of the lineation arrow to the midpoint of the strike line of the planar-feature symbol; the junction point is at the point of observation. For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation. May also be shown in black or other colors.
9.98	Inclined fold hinge of generic (type or orientation unspecified) small, minor fold (2nd option)—Showing bearing and plunge		all lineweights .2 mm	
9.99	Horizontal fold hinge of generic (type or orientation unspecified) small, minor fold (1st option)—Showing bearing		dot diameter .5 mm 2.75 mm 6.0 mm 25° 1.25 mm lineweight .2 mm color 100% magenta	
9.100	Horizontal fold hinge of generic (type or orientation unspecified) small, minor fold (2nd option)—Showing bearing		all lineweights .2 mm	
9.101	Inclined fold hinge of small, minor penecontemporaneous soft-sediment fold (1st option)—Showing bearing and plunge		3.0 mm color 100% magenta 20° draft as shown	
9.102	Inclined fold hinge of small, minor penecontemporaneous soft-sediment fold (2nd option)—Showing bearing and plunge		30°	
9.103	Horizontal fold hinge of small, minor penecontemporaneous soft-sediment fold (1st option)—Showing bearing		3.0 mm color 100% magenta draft as shown	
9.104	Horizontal fold hinge of small, minor penecontemporaneous soft-sediment fold (2nd option)—Showing bearing		all lineweights .2 mm	
9.105	Inclined fold hinge of small, minor anticline (1st option)—Showing bearing and plunge		color 100% magenta 3.5 mm 20° draft as shown	
9.106	Inclined fold hinge of small, minor anticline (2nd option)—Showing bearing and plunge		30°	
9.107	Horizontal fold hinge of small, minor anticline (1st option)—Showing bearing. Ball on topographically higher side of fold		dot diameter .5 mm 3.5 mm draft as shown	
9.108	Horizontal fold hinge of small, minor anticline (2nd option)—Showing bearing. Ball on topographically higher side of fold		all lineweights .2 mm color 100% magenta 4 mm	
9.109	Inclined fold hinge of small, minor antiform (1st option)—Showing bearing and plunge		color 100% magenta 3.3 mm 20° draft as shown	
9.110	Inclined fold hinge of small, minor antiform (2nd option)—Showing bearing and plunge		30°	
9.111	Horizontal fold hinge of small, minor antiform (1st option)—Showing bearing. Ball on topographically higher side of fold		dot diameter .5 mm 3.5 mm draft as shown	
9.112	Horizontal fold hinge of small, minor antiform (2nd option)—Showing bearing. Ball on topographically higher side of fold		all lineweights .2 mm color 100% magenta 4 mm	
9.113	Inclined fold hinge of small, minor syncline (1st option)—Showing bearing and plunge		color 100% magenta 2.45 mm 20° draft as shown	
9.114	Inclined fold hinge of small, minor syncline (2nd option)—Showing bearing and plunge		30°	
9.115	Horizontal fold hinge of small, minor syncline (1st option)—Showing bearing. Ball on topographically higher side of fold		dot diameter .5 mm 2.45 mm draft as shown	
9.116	Horizontal fold hinge of small, minor syncline (2nd option)—Showing bearing. Ball on topographically higher side of fold		all lineweights .2 mm color 100% magenta 1.3 mm	
9.117	Inclined fold hinge of small, minor synform (1st option)—Showing bearing and plunge		color 100% magenta 3.3 mm 20° draft as shown	
9.118	Inclined fold hinge of small, minor synform (2nd option)—Showing bearing and plunge		30°	
9.119	Horizontal fold hinge of small, minor synform (1st option)—Showing bearing. Ball on topographically higher side of fold		dot diameter .5 mm 3.3 mm draft as shown	
9.120	Horizontal fold hinge of small, minor synform (2nd option)—Showing bearing. Ball on topographically higher side of fold		all lineweights .2 mm color 100% magenta 8 mm	

*For more information, see general guidelines on pages A-i to A-v.

9—LINEATION (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
9.121	Inclined symmetric minor fold hinge (1st option)— Showing bearing and plunge		color 100% magenta draft as shown 2.75 mm 6.0 mm HI-6 (100% black) 25° all lineweights .2 mm 1.25 mm	Open-arrowed ("2nd option") symbols may be used to show a second generation or another instance of a particular lineation.
9.122	Inclined symmetric minor fold hinge (2nd option)— Showing bearing and plunge			
9.123	Horizontal symmetric minor fold hinge (1st option)— Showing bearing		color 100% magenta draft as shown 2.5 mm 6.0 mm 25° all lineweights .2 mm 1.25 mm	Lineation symbols may be used separately or combined with other symbols.
9.124	Horizontal symmetric minor fold hinge (2nd option)— Showing bearing			
9.125	Inclined asymmetric (S-shaped, counterclockwise sense of shear) minor fold hinge (1st option)— Showing bearing and plunge		color 100% magenta draft as shown 3.0 mm all lineweights .2 mm	For lineation symbols representing a single observation at one locality, the point of observation is at one of the following two places: for inclined lineations, at the "tail" end (opposite the arrow-head); for horizontal lineations, at the midpoint of the bearing line.
9.126	Inclined asymmetric (S-shaped, counterclockwise sense of shear) minor fold hinge (2nd option)— Showing bearing and plunge			
9.127	Horizontal asymmetric (S-shaped, counterclockwise sense of shear) minor fold hinge (1st option)— Showing bearing		color 100% magenta draft as shown 3.0 mm all lineweights .2 mm	For a single lineation symbol combined with a single planar-feature (for example, bedding or foliation) symbol, join the "tail" end of the lineation arrow to the midpoint of the strike line of the planar-feature symbol; the junction point is at the point of observation.
9.128	Horizontal asymmetric (S-shaped, counterclockwise sense of shear) minor fold hinge (2nd option)— Showing bearing			
9.129	Inclined asymmetric (Z-shaped, clockwise sense of shear) minor fold hinge (1st option)— Showing bearing and plunge		color 100% magenta draft as shown 3.0 mm all lineweights .2 mm	For multiple observations at one locality, join all symbols at their "tail" ends (opposite the arrowheads or other ornamentations); the junction point is at the point of observation.
9.130	Inclined asymmetric (Z-shaped, clockwise sense of shear) minor fold hinge (2nd option)— Showing bearing and plunge			
9.131	Horizontal asymmetric (Z-shaped, clockwise sense of shear) minor fold hinge (1st option)— Showing bearing		color 100% magenta draft as shown 3.0 mm all lineweights .2 mm	May also be shown in black or other colors.
9.132	Horizontal asymmetric (Z-shaped, clockwise sense of shear) minor fold hinge (2nd option)— Showing bearing			
9.133	Inclined crenulation lineation (1st option)— Showing bearing and plunge		color 100% magenta draft as shown 3.0 mm all lineweights .2 mm	
9.134	Inclined crenulation lineation (2nd option)— Showing bearing and plunge			
9.135	Horizontal crenulation lineation (1st option)— Showing bearing		color 100% magenta draft as shown 3.0 mm all lineweights .2 mm	
9.136	Horizontal crenulation lineation (2nd option)— Showing bearing			
9.137	Inclined asymmetric (S-shaped, counterclockwise sense of shear) kink-band crenulation lineation (1st option)— Showing bearing and plunge		color 100% magenta draft as shown 3.0 mm all lineweights .2 mm	
9.138	Inclined asymmetric (S-shaped, counterclockwise sense of shear) kink-band crenulation lineation (2nd option)— Showing bearing and plunge			
9.139	Horizontal asymmetric (S-shaped, counterclockwise sense of shear) kink-band crenulation lineation (1st option)— Showing bearing		color 100% magenta draft as shown 3.0 mm all lineweights .2 mm	
9.140	Horizontal asymmetric (S-shaped, counterclockwise sense of shear) kink-band crenulation lineation (2nd option)— Showing bearing			
9.141	Inclined asymmetric (Z-shaped, clockwise sense of shear) kink-band crenulation lineation (1st option)— Showing bearing and plunge		color 100% magenta draft as shown 3.0 mm all lineweights .2 mm	
9.142	Inclined asymmetric (Z-shaped, clockwise sense of shear) kink-band crenulation lineation (2nd option)— Showing bearing and plunge			
9.143	Horizontal asymmetric (Z-shaped, clockwise sense of shear) kink-band crenulation lineation (1st option)— Showing bearing		color 100% magenta draft as shown 3.0 mm all lineweights .2 mm	
9.144	Horizontal asymmetric (Z-shaped, clockwise sense of shear) kink-band crenulation lineation (2nd option)— Showing bearing			

*For more information, see general guidelines on pages A-i to A-v.

10—PALEONTOLOGICAL FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*				
10.1—Fossil locality								
10.1.1	Fossil locality—Showing collection number		 line weight .2 mm dot diameter .5 mm	May be shown in red or other colors.				
REF NO	DESCRIPTION	SYMBOL	REF NO	DESCRIPTION	SYMBOL	REF NO	DESCRIPTION	SYMBOL
10.2—Fossil symbols			10.2—Fossil symbols (continued)			10.2—Fossil symbols (continued)		
10.2.1	Macrofossils		10.2.23	Gastropods		10.2.45	Microfossils	
10.2.2	Invertebrates		10.2.24	Pelecypods		10.2.46	Conodonts	
10.2.3	Annelids		10.2.25	Sponges		10.2.47	Diatoms	
10.2.4	Arthropods		10.2.26	Vertebrates		10.2.48	Foraminifera	
10.2.5	Arachnids		10.2.27	Amphibians		10.2.49	Larger foraminifera, or fusulinids	
10.2.6	Crustaceans		10.2.28	Fish		10.2.50	Smaller, benthonic foraminifera	
10.2.7	Insects		10.2.29	Mammals		10.2.51	Smaller, planktonic foraminifera	
10.2.8	Trilobites		10.2.30	Reptiles		10.2.52	Nannofossils	
10.2.9	Brachiopods		10.2.31	Plants		10.2.53	Ostracodes	
10.2.10	Bryozoans		10.2.32	Leaves		10.2.54	Palynomorphs	
10.2.11	Cnidarians		10.2.33	Roots		10.2.55	Acritarchs	
10.2.12	Corals		10.2.34	Wood		10.2.56	Chitinozoans	
10.2.13	Stromatoporoids		10.2.35	Algae		10.2.57	Dinoflagellates	
10.2.14	Echinoderms		10.2.36	Conifers		10.2.58	Pollen and (or) spores	
10.2.15	Crinoids		10.2.37	Ferns		10.2.59	Radiolarians	
10.2.16	Echinoids		10.2.38	Flowering plants		10.2.60	Silicoflagellates	
10.2.17	Graptolites		10.2.39	Stromatolites		10.2.61	Spicules	
10.2.18	Mollusks		10.2.40	Fungi		CARTOGRAPHIC SPECIFICATIONS*		
10.2.19	Cephalopods		10.2.41	Trace fossils		 all line weights .125 mm draft as shown size may vary	 fill color 100% white	 fill color 100% black
10.2.20	Ammonoids		10.2.42	Burrows		NOTES ON USAGE*		
10.2.21	Belemnoids		10.2.43	Coprolites		Fossil symbols are usually reserved for use on stratigraphic columns, sections, or charts. Cartographic specifications (shown for two examples above) pertain to all fossil symbols. Fossil symbols may be reduced in size, and line weights reduced accordingly; however, note that line weights below .125 mm may not plot correctly if output at higher resolutions (1800 dpi or higher). May also be shown in other colors.		
10.2.22	Nautiloids		10.2.44	Tracks				

11—GEOPHYSICAL AND STRUCTURE CONTOURS

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
11.1	Geophysical contour (index)—Accurately located		lineweight .325 mm HI-8 line and text color 100% red	On most maps, every fourth or fifth contour should be an index contour.
11.2	Geophysical contour (index)—Showing datum (in parentheses): SL, sea level			Only index contours are labeled. Negative values must be preceded by a minus (–) sign.
11.3	Geophysical contour (index)—Accurately located. Hachures point into closed areas of lower values		hachure lineweight .2 mm 5.0 mm 1.0 mm	Add hachures to indicate closed areas of low values or if it is unclear that contour values are decreasing (hachures point into areas of low value).
11.4	Geophysical contour (index)—Approximately located where data are incomplete		.5 mm 4.5 mm	May be shown in black or other colors.
11.5	Geophysical contour (index)—Approximately located where data are incomplete. Hachures point into closed areas of lower values		hachure lineweight .2 mm 5.0 mm 1.0 mm	
11.6	Geophysical contour (intermediate)—Accurately located		lineweight .2 mm line color 100% red	
11.7	Geophysical contour (intermediate)—Accurately located. Hachures point into closed areas of lower values		all lineweights .2 mm 5.0 mm 1.0 mm	
11.8	Geophysical contour (intermediate)—Approximately located where data are incomplete		.5 mm 4.5 mm	
11.9	Geophysical contour (intermediate)—Approximately located where data are incomplete. Hachures point into closed areas of lower values		5.0 mm 1.0 mm	
11.10	Geophysical data collection locality		2.0 mm line color 100% red 90° lineweight .25 mm	May be shown in black or other colors.
11.11	Geophysical data collection locality—Showing value where known		line and text color 100% red 752 HI-7	
11.12	Maximum or minimum intensity value within closed high or closed low		lineweights .15 mm 30° 2.0 mm 2864 HI-7 line and text color 100% red	
11.13	Structure contour, 1st surface (index)—Accurately located		lineweight .4 mm HI-9 line and text color 100% red	On most maps, every fourth or fifth contour should be an index contour.
11.14	Structure contour, 1st surface (index)—Showing datum (in parentheses): SL, sea level			Only index contours are labeled. Negative values must be preceded by a minus (–) sign.
11.15	Structure contour, 1st surface (index)—Accurately located. Hachures point into closed areas of lower values		hachure lineweight .2 mm 5.5 mm 1.0 mm	Add hachures to indicate closed areas of low values or if it is unclear that contour values are decreasing (hachures point into areas of low value).
11.16	Structure contour, 1st surface (index)—Approximately located where control is poor		.5 mm 5.0 mm	May be shown in black or other colors.
11.17	Structure contour, 1st surface (index)—Approximately located where control is poor. Hachures point into closed areas of lower values		5.5 mm 1.0 mm	
11.18	Structure contour, 1st surface (intermediate)—Accurately located		lineweight .275 mm	
11.19	Structure contour, 1st surface (intermediate)—Accurately located. Hachures point into closed areas of lower values		hachure lineweight .2 mm 5.5 mm 1.0 mm	
11.20	Structure contour, 1st surface (intermediate)—Approximately located where control is poor		.5 mm 5.0 mm	
11.21	Structure contour, 1st surface (intermediate)—Approximately located where control is poor. Hachures point into closed areas of lower values		5.5 mm 1.0 mm	
11.22	Outcrop point as structural control point (1st surface)		line and text color 100% red 90° 2.0 mm 1520 HI-7 lineweight .275 mm	May be shown in black or other colors.

*For more information, see general guidelines on pages A-i to A-v.

11—GEOPHYSICAL AND STRUCTURE CONTOURS (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
11.23	Structure contour, 2nd surface (index)—Accurately located		lineweight .4 mm HI-9 line and text color 100% violet	On most maps, every fourth or fifth contour should be an index contour. Only index contours are labeled. Negative values must be preceded by a minus (–) sign. Add hachures to indicate closed areas of low values or if it is unclear that contour values are decreasing (hachures point into areas of low value). May be shown in black or other colors.
11.24	Structure contour, 2nd surface (index)—Showing datum (in parentheses): SL, sea level			
11.25	Structure contour, 2nd surface (index)—Accurately located. Hachures point into closed areas of lower values		hachure lineweight .2 mm 5.5 mm 1.0 mm 5.0 mm	
11.26	Structure contour, 2nd surface (index)—Approximately located where control is poor		5.5 mm 5.0 mm	
11.27	Structure contour, 2nd surface (index)—Approximately located where control is poor. Hachures point into closed areas of lower values		5.5 mm 1.0 mm	
11.28	Structure contour, 2nd surface (intermediate)—Accurately located		lineweight .275 mm	
11.29	Structure contour, 2nd surface (intermediate)—Accurately located. Hachures point into closed areas of lower values		hachure lineweight .2 mm 5.5 mm 1.0 mm	
11.30	Structure contour, 2nd surface (intermediate)—Approximately located where control is poor		5.5 mm 5.0 mm	
11.31	Structure contour, 2nd surface (intermediate)—Approximately located where control is poor. Hachures point into closed areas of lower values		5.5 mm 1.0 mm	
11.32	Outcrop point as structural control point (2nd surface)		line and text color 100% violet 90° HI-7 2.0 mm 2.0 mm lineweight .275 mm	May be shown in black or other colors.
11.33	Structure contour, 3rd surface (index)—Accurately located		lineweight .4 mm HI-9 line and text color 100% green	On most maps, every fourth or fifth contour should be an index contour. Only index contours are labeled. Negative values must be preceded by a minus (–) sign. Add hachures to indicate closed areas of low values or if it is unclear that contour values are decreasing (hachures point into areas of low value). May be shown in black or other colors.
11.34	Structure contour, 3rd surface (index)—Showing datum (in parentheses): SL, sea level			
11.35	Structure contour, 3rd surface (index)—Accurately located. Hachures point into closed areas of lower values		hachure lineweight .2 mm 5.5 mm 1.0 mm 5.0 mm	
11.36	Structure contour, 3rd surface (index)—Approximately located where control is poor		5.5 mm 5.0 mm	
11.37	Structure contour, 3rd surface (index)—Approximately located where control is poor. Hachures point into closed areas of lower values		5.5 mm 1.0 mm	
11.38	Structure contour, 3rd surface (intermediate)—Accurately located		lineweight .275 mm	
11.39	Structure contour, 3rd surface (intermediate)—Accurately located. Hachures point into closed areas of lower values		hachure lineweight .2 mm 5.5 mm 1.0 mm	
11.40	Structure contour, 3rd surface (intermediate)—Approximately located where control is poor		5.5 mm 5.0 mm	
11.41	Structure contour, 3rd surface (intermediate)—Approximately located where control is poor. Hachures point into closed areas of lower values		5.5 mm 1.0 mm	
11.42	Outcrop point as structural control point (3rd surface)		line and text color 100% green 90° HI-7 2.0 mm 2.0 mm lineweight .275 mm	May be shown in black or other colors.

*For more information, see general guidelines on pages A-i to A-v.

12—FLUVIAL AND ALLUVIAL FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
12.1	Fluvial terrace scarp—Identity and existence certain, location accurate. Hachures point downscarp		<p>all lineweights .2 mm</p> <p>2.0 mm</p> <p>H-8</p> <p>1.125 mm</p> <p>.75 mm</p> <p>12.0 mm</p> <p>color 100% cyan</p> <p>3.5 mm</p> <p>.75 mm .75 mm</p>	May also be shown in black or other colors.
12.2	Fluvial terrace scarp—Identity or existence questionable, location accurate. Hachures point downscarp			
12.3	Fluvial terrace scarp—Identity and existence certain, location approximate. Hachures point downscarp			
12.4	Fluvial terrace scarp—Identity or existence questionable, location approximate. Hachures point downscarp			
12.5	Fluvial transport direction		<p>linewidth .2 mm</p> <p>1.75 mm</p> <p>25°</p> <p>6.0 mm</p> <p>color 100% cyan</p>	
12.6	Sediment transport direction determined from imbrication		<p>circle diameters .75 mm</p> <p>6.0 mm</p> <p>color 100% cyan</p> <p>all lineweights .2 mm</p>	
12.7	Sediment transport direction determined from crossbeds		<p>90°</p> <p>1.25 mm</p> <p>5.5 mm</p> <p>color 100% cyan</p> <p>all lineweights .2 mm</p>	
12.8	Sediment transport direction determined from flute casts		<p>90°</p> <p>1.375 mm</p> <p>5.5 mm</p> <p>color 100% cyan</p> <p>all lineweights .2 mm</p>	

*For more information, see general guidelines on pages A-i to A-v.

13—GLACIAL AND GLACIOFLUVIAL FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
13.1	Crevasse on glacier		lineweights .2 mm color 100% cyan lengths may vary	
13.2	Ice-flow direction		lineweight .25 mm color 100% cyan length may vary 60° 1.5 mm	
13.3	Glacial-lake spillway—Arrow shows direction of flow		color 100% cyan 1.25 mm lineweight .2 mm 25° 60° 2.0 mm length may vary	
13.4	Glacial-lake spillway—Showing elevation. Arrow shows direction of flow		785' HI-6 (100% black)	
13.5	Inferred glacial-lake spillway—Arrow shows direction of flow		all lineweights .2 mm	
13.6	Inferred glacial-lake spillway—Showing estimated elevation. Arrow shows direction of flow		785'	
13.7	Glacial meltwater stream—Barbs show direction of flow		all lineweights .2 mm 7.5 mm color 100% cyan 3.0 mm 2.25 mm spacing may vary ≤ 20°	
13.8	Cutbanks of glacial meltwater stream channel (mapped to scale)—Hachures point into channel		all lineweights .25 mm color 100% cyan 1.125 mm 3.0 mm	
13.9	Flow direction of glacial meltwater in stream channel		color 100% cyan all lineweights .2 mm 2.0 mm stem lengths may vary ≤ 25°	
13.10	Crest line of moraine, sense of symmetry unspecified (1st option)		color 100% cyan lineweight .2 mm circle diameter .75 mm; spacing .625 mm	
13.11	Crest line of moraine, sense of symmetry unspecified (2nd option)		color 100% cyan dot diameter .825 mm; spacing .625 mm	
13.12	Crest line of symmetrical moraine		color 100% cyan 3.0 mm .5 mm all lineweights .2 mm circle diameter .675 mm; hachure height 1.5 mm	
13.13	Crest line of asymmetrical moraine—Ticks point down steeper slope		hachure height .75 mm	
13.14	Ridges on moraine		color 100% cyan lineweight .25 mm lengths and spacing may vary	
13.15	Scarp at top of ice-contact slope—Hachures point downscarp		.5 mm 1.375 mm 12° color 100% cyan	
13.16	Ice-contact slope		pattern 521-C in 50% cyan	
13.17	Esker or ice-channel deposit, transport direction unknown		1.25 mm .375 mm .625 mm color 100% cyan lineweight .2 mm 70°	
13.18	Esker or ice-channel deposit, transport direction known (1st option)—Chevrons point in direction of transport		color 100% cyan 70° 1.25 mm 1.0 mm lineweight .2 mm	
13.19	Esker or ice-channel deposit, transport direction known (2nd option)—Chevrons point in direction of transport		color 100% cyan 70° 5.0 mm 1.25 mm lineweight .375 mm lineweight .2 mm	
13.20	Drumlin—Showing bearing and direction of flow		2.25 mm 1.25 mm 25° 1.875 mm 6.0 mm color 100% cyan all lineweights .2 mm	Point of observation is at the midpoint of the bearing line.
13.21	Drumlin, flow direction unknown (1st option)—Showing bearing		1.875 mm 6.0 mm lineweight .2 mm	May also be shown in black or other colors.
13.22	Drumlin, flow direction unknown (2nd option)—Showing bearing		1.75 mm 1.0 mm 3.5 mm lineweight .2 mm color 100% cyan	
13.23	Drumlin (length mapped to scale)—Showing bearing and direction of flow		color 100% cyan 1.25 mm draw length to scale 1.25 mm 25° all lineweights .2 mm	Use when map scale is large enough to show actual length of drumlin.
13.24	Drumlin (length mapped to scale), flow direction unknown—Showing bearing		draw length to scale	May also be shown in black or other colors.

*For more information, see general guidelines on pages A-i to A-v.

13—GLACIAL AND GLACIOFLUVIAL FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
13.25	Kettle		color 100% cyan 45° 1.75 mm 3.0 mm all lineweights .2 mm	May also be shown in black or other colors.
13.26	Hummocky topography (1st option)		pattern 523-K in 50% black	
13.27	Hummocky topography (2nd option)		pattern 523-DO in 50% black	
13.28	Hummocky topography (3rd option)		pattern 524-K in 50% black	
13.29	Younger glacial striation or groove—Showing general bearing and direction of flow		lineweight .2 mm 6.0 mm 25° 1.25 mm color 100% cyan	Point of observation is at the midpoint of the bearing line.
13.30	Younger glacial striation or groove—Showing measured bearing and direction of flow. Dot indicates location of observation point		2.625 mm dot diameter .75 mm	May also be shown in black or other colors.
13.31	Older glacial striation or groove—Showing general bearing and direction of flow		2.625 mm all lineweights .2 mm dot diameter .75 mm	
13.32	Older glacial striation or groove—Showing measured bearing and direction of flow. Open circle indicates location of observation point		2.625 mm all lineweights .2 mm circle diameter .75 mm	
13.33	Younger glacial striation or groove, flow direction unknown—Showing general bearing		lineweight .2 mm 6.0 mm color 100% cyan	
13.34	Younger glacial striation or groove, flow direction unknown—Showing measured bearing. Dot indicates location of observation point		2.625 mm dot diameter .75 mm	
13.35	Older glacial striation or groove, flow direction unknown—Showing general bearing		2.625 mm all lineweights .2 mm dot diameter .75 mm	
13.36	Older glacial striation or groove, flow direction unknown—Showing measured bearing. Open circle indicates location of observation point		2.625 mm all lineweights .2 mm circle diameter .75 mm	
13.37	Younger glacial striation or groove (length mapped to scale)—Arrow shows direction of flow		lineweight .2 mm length may vary 25° 1.5 mm color 100% cyan	Use when map scale is large enough to show actual length of striation or groove.
13.38	Younger glacial striation or groove (length mapped to scale), flow direction unknown		length may vary	May also be shown in black or other colors.
13.39	Older glacial striation or groove (length mapped to scale)—Arrow shows direction of flow		lineweight .2 mm 2.125 mm length may vary color 100% cyan dot diameter .75 mm	
13.40	Older glacial striation or groove (length mapped to scale), flow direction unknown		length may vary	
13.41	Cirque headwall—Hachures point into cirque		lineweight .2 mm color 100% cyan hachure height 1.0 mm; spacing 1.0 mm lineweight .3 mm	May also be shown in black or other colors.
13.42	Arête or headwall of adjoining cirques		lineweight .2 mm color 100% cyan hachure height 2.0 mm; spacing 1.0 mm lineweight .3 mm	
13.43	Margin of glacially scoured basin—Identity and existence certain, location accurate. Hachures point into basin		all lineweights .225 mm color 100% cyan H-8 1.0 mm 12.0 mm 1.0 mm 2.0 mm	
13.44	Margin of glacially scoured basin—Identity or existence questionable, location accurate. Hachures point into basin			
13.45	Margin of glacially scoured basin—Identity and existence certain, location approximate. Hachures point into basin		3.5 mm 2.0 mm 1.0 mm 2.0 mm	
13.46	Margin of glacially scoured basin—Identity or existence questionable, location approximate. Hachures point into basin		.75 mm .75 mm	
13.47	Margin of glacially scoured basin—Identity and existence certain, location concealed. Hachures point into basin		1.25 mm	
13.48	Margin of glacially scoured basin—Identity or existence questionable, location concealed. Hachures point into basin		.75 mm .75 mm	

*For more information, see general guidelines on pages A-i to A-v.

13—GLACIAL AND GLACIOFLUVIAL FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
13.49	Glacial limit or terminus—Identity and existence certain, location accurate		lineweight .45 mm color 100% cyan	May also be shown in black or other colors.
13.50	Glacial limit or terminus—Identity or existence questionable, location accurate			
13.51	Glacial limit or terminus—Identity and existence certain, location approximate			
13.52	Glacial limit or terminus—Identity or existence questionable, location approximate			
13.53	Glacial limit or terminus—Identity and existence certain, location inferred			
13.54	Glacial limit or terminus—Identity or existence questionable, location inferred			
13.55	Glacial limit or terminus—Identity and existence certain, location concealed			
13.56	Glacial limit or terminus—Identity or existence questionable, location concealed			
13.57	Glacial limit or terminus—Showing name of glaciation (BL, Bull Lake)			
13.58	Limit of significant glacial advance—Identity and existence certain, location accurate. Hachures on side of advancing ice		lineweight .3 mm color 100% cyan	
13.59	Limit of significant glacial advance—Identity or existence questionable, location accurate. Hachures on side of advancing ice			
13.60	Limit of significant glacial advance—Identity and existence certain, location approximate. Hachures on side of advancing ice			
13.61	Limit of significant glacial advance—Identity or existence questionable, location approximate. Hachures on side of advancing ice			
13.62	Limit of significant glacial advance—Identity and existence certain, location concealed. Hachures on side of advancing ice			
13.63	Limit of significant glacial advance—Identity or existence questionable, location concealed. Hachures on side of advancing ice			
13.64	Retreatal position of stagnant ice margin—Identity and existence certain, location accurate		lineweight .3 mm color 100% cyan	
13.65	Retreatal position of stagnant ice margin—Identity or existence questionable, location accurate			
13.66	Retreatal position of stagnant ice margin—Identity and existence certain, location approximate			
13.67	Retreatal position of stagnant ice margin—Identity or existence questionable, location approximate			
13.68	Retreatal position of stagnant ice margin—Identity and existence certain, location inferred			
13.69	Retreatal position of stagnant ice margin—Identity or existence questionable, location inferred			
13.70	Retreatal position of stagnant ice margin—Identity and existence certain, location concealed			
13.71	Retreatal position of stagnant ice margin—Identity or existence questionable, location concealed			
13.72	Retreatal position of stagnant ice margin—Showing name of depositional unit			

*For more information, see general guidelines on pages A-i to A-v.

14—PERIGLACIAL FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
14.1	Pingo		all lineweights .2 mm dot diameter .325 mm circle diameter 1.5 mm color 100% cyan 60° .875 mm	May also be shown in black or other colors.
14.2	Periglacial patterned ground		pattern 591-C	
14.3	Polygonal patterned ground		pattern 592-C	
14.4	Sorted circles		diameter .9 mm lineweight .2 mm color 100% cyan	
14.5	Stone stripe, fine debris		circle diameter .9 mm; spacing .45 mm circle lineweight .2 mm	
14.6	Stone stripe, coarse debris		color 100% cyan dot diameter .5 mm; spacing 1.25 mm	
14.7	Solifluction lobes		pattern 593-C	
14.8	Ice-wedge polygon		2.25 mm color 100% cyan	
14.9	Ice-wedge polygons		pattern 594-C	
14.10	Felsenmeer		pattern 595-C	
14.11	Thermokarst depression		color 100% cyan all lineweights .2 mm hachure height 1.0 mm; spacing 1.75 mm	

*For more information, see general guidelines on pages A-i to A-v.

15—LACUSTRINE AND MARINE FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
15.1	Beach		color 100% cyan dot diameter .75 mm; spacing .75 mm	May also be shown in black or other colors.
15.2	Beach ridges		color 100% cyan lineweight .2 mm length and spacing may vary	
15.3	Marine-abrasion platform (1st option)		pattern 201-C (at 45°)	
15.4	Marine-abrasion platform (2nd option)		pattern 522-C	
15.5	Aggradational shoreline—Identity and existence certain, location accurate. Triangles point offshore		color 100% cyan lineweight .2 mm H-8	
15.6	Aggradational shoreline—Identity or existence questionable, location accurate. Triangles point offshore		1.5 mm 12.0 mm 2.0 mm 22° .75 mm	
15.7	Aggradational shoreline—Identity and existence certain, location approximate. Triangles point offshore		3.5 mm	
15.8	Aggradational shoreline—Identity or existence questionable, location approximate. Triangles point offshore		.75 mm .75 mm	
15.9	Erosional shoreline—Identity and existence certain, location accurate. Triangles point onshore		color 100% cyan lineweight .2 mm H-8	
15.10	Erosional shoreline—Identity or existence questionable, location accurate. Triangles point onshore		1.5 mm 12.0 mm 2.0 mm 22° .75 mm	
15.11	Erosional shoreline—Identity and existence certain, location approximate. Triangles point onshore		3.5 mm	
15.12	Erosional shoreline—Identity or existence questionable, location approximate. Triangles point onshore		.75 mm .75 mm	
15.13	Former shoreline or marine limit—Identity and existence certain, location accurate		lineweight .25 mm color 100% cyan H-8	
15.14	Former shoreline or marine limit—Identity or existence questionable, location accurate		.75 mm 12.0 mm	
15.15	Former shoreline or marine limit—Identity and existence certain, location approximate		3.5 mm	
15.16	Former shoreline or marine limit—Identity or existence questionable, location approximate		.75 mm .75 mm	
15.17	Former shoreline or marine limit—Identity and existence certain, location inferred		1.5 mm	
15.18	Former shoreline or marine limit—Identity or existence questionable, location inferred		.75 mm .75 mm	
15.19	Former shoreline or marine limit—Identity and existence certain, location concealed		.5 mm	
15.20	Former shoreline or marine limit—Identity or existence questionable, location concealed		.75 mm .75 mm	
15.21	Former shoreline or marine limit—Showing name (B, Bonneville)		H-8 (100% black) B	

*For more information, see general guidelines on pages A-i to A-v.

15—LACUSTRINE AND MARINE FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
15.22	Shoreline cliff—Identity and existence certain, location accurate. Hachures point down cliff		<p>color 100% cyan all lineweights .2 mm</p>	May also be shown in black or other colors.
15.23	Shoreline cliff—Identity or existence questionable, location accurate. Hachures point down cliff			
15.24	Shoreline cliff—Identity and existence certain, location approximate. Hachures point down cliff			
15.25	Shoreline cliff—Identity or existence questionable, location approximate. Hachures point down cliff			
15.26	Spit or bar—Identity and existence certain, location accurate		<p>color 100% cyan all lineweights .2 mm</p>	
15.27	Spit or bar—Identity or existence questionable, location accurate			
15.28	Spit or bar—Identity and existence certain, location approximate			
15.29	Spit or bar—Identity or existence questionable, location approximate			

*For more information, see general guidelines on pages A-i to A-v.

16—EOLIAN FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
16.1	Dune crest		lineweight .25 mm dash .375 mm; space .3 mm	Dune forms shown by traces of dune crests.
16.2	Scarp on dune crest, caused by slip—Hachures point down slip face of dune		hachure lineweight .2 mm; height 1.0 mm; spacing 4.75 mm	
16.3	Blowout rim around closed depression of eolian origin in dune field—Hachures point into closed depression		all lineweights .15 mm hachure height .875 mm; spacing 3.5 mm long dash 1.4 mm; short dash .5 mm; space .375 mm	
16.4	Blowout rim around closed depression of eolian origin in bedrock—Accurately located. Hachures point into closed depression		all lineweights .2 mm hachure height .875 mm; spacing 2.5 mm	
16.5	Blowout rim around closed depression of eolian origin in bedrock—Approximately located. Hachures point into closed depression		2.5 mm 5 mm	
16.6	Edge of dry lakebed within closed depression of eolian origin in bedrock		lineweight .15 mm; dash length 1.5 mm; space .375 mm	
16.7	Sediment transport direction determined from dune forms		all lineweights .15 mm 1.5 mm .875 mm 5.0 mm .875 mm 20° 1.0 mm 1.25 mm	Point of observation is at the midpoint of the bearing line.
16.8	Sediment transport direction determined from dune bedding in horizontal section		1.25 mm 1.5 mm 1.0 mm .875 mm radius all lineweights .15 mm	
16.9	Sediment transport direction determined from eolian crossbedding in vertical or near-vertical section		.5 mm 2.5 mm 1.0 mm dot diameter .3 mm; spacing .225 mm 40°	

*For more information, see general guidelines on pages A-i to A-v.

17—LANDSLIDE AND MASS-WASTING FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
17.1	Outline of slip surface of landslide—Identity and existence certain, location accurate		linecolor 60% black lineweight .2 mm	May be used to outline area of slip surface of landslide if desired. Do not use to outline landslide deposits (use a map-unit-boundary contact instead).
17.2	Outline of slip surface of landslide—Identity or existence questionable, location accurate		H-8 (60% black) 12.0 mm 7.5 mm	
17.3	Outline of slip surface of landslide—Identity and existence certain, location approximate		3.5 mm	
17.4	Outline of slip surface of landslide—Identity or existence questionable, location approximate		7.5 mm 7.5 mm	
17.5	Outline of slip surface of landslide—Identity and existence certain, location inferred		1.5 mm	
17.6	Outline of slip surface of landslide—Identity or existence questionable, location inferred		7.5 mm 7.5 mm	
17.7	Outline of slip surface of landslide—Identity and existence certain, location concealed		.5 mm	
17.8	Outline of slip surface of landslide—Identity or existence questionable, location concealed		7.5 mm 7.5 mm	
17.9	Area of slip surface of landslide		pattern 431-K in 50% black (rotated so lines parallel slip direction)	Downslope edge of slip surface is usually concealed by landslide deposits or debris materials. Landslide arrows may be shown singly or in pairs.
17.10	Direction of downslope movement of landslide		outline of slip surface [lineweight .2 mm, in 60% black] contact [lineweight .15 mm] 50°/2.0 mm	
17.11	Landslide deposits—Arrows show direction of downslope movement		arrow lineweight .175 mm length and curve of arrow may vary	
17.12	Head or main scarp of landslide—Active, sharp, distinct, and accurately located		all lineweights .25 mm hachure height 1.0 mm; spacing 1.75 mm	Place line along crown of scarp; hachures point downscarp. May be shown in red or other colors.
17.13	Head or main scarp of landslide—Inactive, subdued, indistinct, and (or) approximately located		.5 mm 3.0 mm	
17.14	Head or main scarp of landslide—Showing height (in meters)		0.8 HI-7	
17.15	Head or main scarp of rotated block in landslide—Arrow shows direction of oblique slip		5.0 mm 2.5 mm 15° arrow lineweight .175 mm	
17.16	Internal or minor scarp in landslide—Active, sharp, distinct, and accurately located		all lineweights .25 mm hachure height .75 mm; spacing 1.25 mm	
17.17	Internal or minor scarp in landslide—Inactive, subdued, indistinct, and (or) approximately located		.5 mm 2.0 mm	
17.18	Internal or minor scarp in landslide—Showing height (in meters)		0.3 HI-6	
17.19	Internal or minor scarp of rotated block in landslide—Arrow shows direction of oblique slip		4.5 mm 15° 2.0 mm arrow lineweight .175 mm	

*For more information, see general guidelines on pages A-i to A-v.

17—LANDSLIDE AND MASS-WASTING FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
17.20	Main toe of landslide—Active, sharp, distinct, and accurately located			Place line along base of toe; sawteeth on over-riding block.
17.21	Main toe of landslide—Inactive, subdued, indistinct, and (or) approximately located			May be shown in red or other colors.
17.22	Minor toe, internal thrust fault, or pressure ridge in landslide—Active, sharp, distinct, and accurately located			
17.23	Minor toe, internal thrust fault, or pressure ridge in landslide—Inactive, subdued, indistinct, and (or) approximately located			
17.24	Minor toe, internal thrust fault, or pressure ridge in landslide, showing transport reversal—Active, sharp, distinct, and accurately located			
17.25	Minor toe, internal thrust fault, or pressure ridge in landslide, showing transport reversal—Inactive, subdued, indistinct, and (or) approximately located			
17.26	Right flank of landslide or right-lateral shear feature—Active, sharp, distinct, and accurately located			Arrow shows sense of lateral movement. Place arrow on side of moving ground or on displaced earth materials.
17.27	Right flank of landslide or right-lateral shear feature—Inactive, subdued, indistinct, and (or) approximately located			In cross section, can also be used to show plane of slope failure.
17.28	Right flank of landslide or right-lateral shear feature—Concealed by landslide deposits or debris materials			May be shown in red or other colors.
17.29	Right flank of landslide or right-lateral shear feature—Showing amount of offset (in meters)			
17.30	Left flank of landslide or left-lateral shear feature—Active, sharp, distinct, and accurately located			
17.31	Left flank of landslide or left-lateral shear feature—Inactive, subdued, indistinct, and (or) approximately located			
17.32	Left flank of landslide or left-lateral shear feature—Concealed by landslide deposits or debris materials			
17.33	Left flank of landslide or left-lateral shear feature—Showing amount of offset (in meters)			
17.34	Open tension crack or fracture on landslide			Hachures point into crack.
17.35	Tension crack or fracture on landslide (1st option)			May be shown in red or other colors.
17.36	Tension crack or fracture on landslide (2nd option)			
17.37	Tension crack or fracture on landslide (3rd option)			
17.38	En echelon cracks or fractures on landslide, indicating right-lateral shear			Arrow shows sense of lateral movement. May be shown in red or other colors.
17.39	En echelon cracks or fractures on landslide, indicating left-lateral shear			
17.40	Anticlinal soft-sediment fold, buckle fold, bulge, or linear ridge on landslide			May be shown in red or other colors.
17.41	Dome structure or bulge on landslide			
17.42	Synclinal soft-sediment fold or linear depression on landslide			
17.43	Basin structure or depression on landslide			

*For more information, see general guidelines on pages A-i to A-v.

17—LANDSLIDE AND MASS-WASTING FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
17.44	Crest line of lateral levee on landslide (1st option)		lineweights .175 mm 1.0 mm 1.5 mm crest line .65 mm angle < 60°	
17.45	Crest line of lateral levee on landslide (2nd option)		1.0 mm 1.5 mm crest line .65 mm angle < 60°	
17.46	Path of gully on landslide		all lineweights .2 mm 25° 4.5 mm 1.375 mm 1.575 mm	
17.47	Soil creep or incipient sliding on landslide		lineweight .2 mm 1.0 mm 6.75 mm 20° 1.5 mm	Arrow points downhill. May be shown in red or other colors.
17.48	Spring, seep, or drainage (runoff) on landslide		lineweight .2 mm circle diameter 1.5 mm; tail length 3.0 mm	Tail points downhill. May be shown in red or other colors.
17.49	Sag pond or closed depression on landslide (mapped to scale)		all lineweights .175 mm hachure height .875 mm; spacing 1.25 mm	Hachures point into depression.
17.50	Hummock on landslide (mapped to scale)		all lineweights .175 mm hachure height .875 mm; spacing 1.25 mm	Hachures point away from hummock.
17.51	Hummock on landslide (shown as point symbol when too small to outline at map scale)		all lineweights .175 mm 60° hachure height .875 mm circle diameter 1.5 mm	
17.52	Tilt direction of surface of landslide		4.0 mm 1.125 mm 2.0 mm 30° lineweight .2 mm 2.0 mm	Usually shown on special-purpose landslide activity maps.
17.53	Tilt direction of surface of landslide—Showing angle of tilt		14 HI-6	May also be shown in red or other colors.
17.54	Displacement vector—Showing bearing		lineweight .2 mm 1.75 mm 6.75 mm 25°	
17.55	Displacement vector—Showing bearing and distance		1.3 HI-7	
17.56	Active, reactivated, or historically active debris flow, showing a sharply defined morphology		4.0 mm 1.5 mm 20° color 100% magenta	Usually shown on special-purpose landslide activity maps.
17.57	Dormant-young debris flow, showing a fresh and uneroded morphology but having no evidence of historic activity		color 50% magenta	If necessary, alphanumeric characters may be added to help distinguish landslide areas.
17.58	Active, reactivated, or historically active landslide (mapped to scale), showing a sharply defined morphology		fill color 60% magenta	May also be shown in red or other colors.
17.59	Dormant-young landslide (mapped to scale), showing a fresh and uneroded morphology but having no evidence of historic activity		fill color 40% magenta	
17.60	Dormant-mature landslide (mapped to scale), showing a smoothed and eroded morphology		fill color 20% magenta	
17.61	Dormant-old or relict landslide (mapped to scale), showing a weak morphology		fill color 8% magenta	
17.62	Rock slide, slump, block-glide landslide, rotational landslide, or Toreva block, consisting of a relatively intact mass of displaced materials		draft as shown 5 mm 90° all lineweights .3 mm	Usually shown on special-purpose landslide activity maps.
17.63	Earth flow, consisting of a relatively thick and jumbled mixture of displaced materials		4.5 mm 1.0 mm 90° all lineweights .3 mm	May also be shown in red or other colors.
17.64	Debris slide, consisting of a loose and relatively shallow veneer of displaced materials		draft as shown 90° all lineweights .3 mm	If necessary, symbols may be enlarged or reduced.
17.65	Debris-slide slope (mapped to scale), consisting of coalesced scars of landslides and debris flows that are too small or numerous to be shown at map scale		fill color 20% black	Usually shown on special-purpose landslide activity maps.

*For more information, see general guidelines on pages A-i to A-v.

18—VOLCANIC FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
18.1	Rim of volcanic crater—Identity and existence certain, location accurate. Hachures point into crater			Use to show outline of topographic wall. Rim may not outline crater completely. May also be shown in red, magenta, or other colors.
18.2	Rim of volcanic crater—Identity or existence questionable, location accurate. Hachures point into crater			
18.3	Rim of volcanic crater—Identity or existence certain, location approximate. Hachures point into crater			
18.4	Rim of volcanic crater—Identity or existence questionable, location approximate. Hachures point into crater			
18.5	Rim of volcanic crater—Identity and existence certain, location concealed. Hachures point into crater			
18.6	Rim of volcanic crater—Identity or existence questionable, location concealed. Hachures point into crater			
18.7	Rim of volcanic crater—Showing low point of crater (dot)			
18.8	Caldera margin (1st option)—Identity and existence certain, location accurate. Ticks point into caldera			May also be shown in red, magenta, or other colors.
18.9	Caldera margin (1st option)—Identity or existence questionable, location accurate. Ticks point into caldera			
18.10	Caldera margin (1st option)—Identity and existence certain, location approximate. Ticks point into caldera			
18.11	Caldera margin (1st option)—Identity or existence questionable, location approximate. Ticks point into caldera			
18.12	Caldera margin (1st option)—Identity and existence certain, location inferred. Ticks point into caldera			
18.13	Caldera margin (1st option)—Identity or existence questionable, location inferred. Ticks point into caldera			
18.14	Caldera margin (1st option)—Identity and existence certain, location concealed. Ticks point into caldera			
18.15	Caldera margin (1st option)—Identity or existence questionable, location concealed. Ticks point into caldera			
18.16	Caldera margin (2nd option)—Identity and existence certain, location accurate. Ticks point into caldera			May also be shown in red, magenta, or other colors.
18.17	Caldera margin (2nd option)—Identity or existence questionable, location accurate. Ticks point into caldera			
18.18	Caldera margin (2nd option)—Identity and existence certain, location approximate. Ticks point into caldera			
18.19	Caldera margin (2nd option)—Identity or existence questionable, location approximate. Ticks point into caldera			
18.20	Caldera margin (2nd option)—Identity and existence certain, location inferred. Ticks point into caldera			
18.21	Caldera margin (2nd option)—Identity or existence questionable, location inferred. Ticks point into caldera			
18.22	Caldera margin (2nd option)—Identity and existence certain, location concealed. Ticks point into caldera			
18.23	Caldera margin (2nd option)—Identity or existence questionable, location concealed. Ticks point into caldera			

*For more information, see general guidelines on pages A-i to A-v.

18—VOLCANIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
18.24	Contact separating individual lava flows within same map unit—Identity and existence certain, location accurate		lineweight .2 mm color 100% red	May also be shown in magenta, black, or other colors.
18.25	Contact separating individual lava flows within same map unit—Identity or existence questionable, location accurate			
18.26	Contact separating individual lava flows within same map unit—Identity and existence certain, location approximate			
18.27	Contact separating individual lava flows within same map unit—Identity or existence questionable, location approximate			
18.28	Contact separating individual lava flows within same map unit—Identity and existence certain, location inferred			
18.29	Contact separating individual lava flows within same map unit—Identity or existence questionable, location inferred			
18.30	Contact separating individual lava flows within same map unit—Identity and existence certain, location concealed			
18.31	Contact separating individual lava flows within same map unit—Identity or existence questionable, location concealed			
18.32	Flow lobe or lava-flow front—Identity and existence certain, location accurate. Hachures on side of overlying younger flow		all lineweights .2 mm color 100% red 	
18.33	Flow lobe or lava-flow front—Identity or existence questionable, location accurate. Hachures on side of overlying younger flow			
18.34	Flow lobe or lava-flow front—Identity and existence certain, location approximate. Hachures on side of overlying younger flow			
18.35	Flow lobe or lava-flow front—Identity or existence questionable, location approximate. Hachures on side of overlying younger flow			
18.36	Flow lobe or lava-flow front—Identity and existence certain, location concealed. Hachures on side of overlying younger flow			
18.37	Flow lobe or lava-flow front—Identity or existence questionable, location concealed. Hachures on side of overlying younger flow			
18.38	Form line on lava flow		lineweight .2 mm color 100% red length and spacing may vary	
18.39	Flow lines on lava flow		color 100% red stem lineweight .175 mm 25° 2.0 mm stem length and spacing may vary	
18.40	Cracks on surface of lava flow		lineweight .25 mm color 100% red length and spacing may vary	
18.41	Volcanic fissure			
18.42	Buried volcanic fissure			
18.43	Volcanic fissure where lava has been emitted		hachure lineweight .15 mm color 100% red	
18.44	Lava tube—Red circles indicate presence of skylights (not mapped to scale) along lava tube		circle lineweight .2 mm; diameter .75 mm; color 100% red lineweight .15 mm 25° 1.375 mm	
18.45	Lava tube—Red circles outline collapses (mapped to scale) along lava tube		lineweight .2 mm; color 100% red	
18.46	Crest line of pressure ridge or tumulus on lava flow		lineweight .2 mm color 100% red 60° 5.5 mm 1.0 mm	
18.47	Pressure ridge on lava flow		lineweight .2 mm color 100% red 60° 5.5 mm 1.0 mm	

*For more information, see general guidelines on pages A-i to A-v.

18—VOLCANIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
18.48	Ice-contact lava-flow margin—Identity and existence certain, location accurate. Rectangles on side of overlying younger flow		lineweight .2 mm color 100% red	May also be shown in magenta, black, or other colors.
18.49	Ice-contact lava-flow margin—Identity or existence questionable, location accurate. Rectangles on side of overlying younger flow		lineweight .2 mm color 100% red H-8 rectangle height .5 mm rectangle width .75 mm rectangle spacing 2.0 mm rectangle length 12.0 mm	
18.50	Ice-contact lava-flow margin—Identity and existence certain, location approximate. Rectangles on side of overlying younger flow		lineweight .2 mm color 100% red rectangle height .5 mm rectangle width .75 mm rectangle spacing 2.0 mm	
18.51	Ice-contact lava-flow margin—Identity or existence questionable, location approximate. Rectangles on side of overlying younger flow		lineweight .2 mm color 100% red rectangle height .5 mm rectangle width .75 mm rectangle spacing 2.0 mm	
18.52	Ice-contact lava-flow margin—Identity and existence certain, location concealed. Rectangles on side of overlying younger flow		lineweight .2 mm color 100% red rectangle height .5 mm rectangle width .75 mm rectangle spacing 2.0 mm	
18.53	Ice-contact lava-flow margin—Identity or existence questionable, location concealed. Rectangles on side of overlying younger flow		lineweight .2 mm color 100% red rectangle height .5 mm rectangle width .75 mm rectangle spacing 2.0 mm	
18.54	Outline of basalt-filled lava pond		all lineweights .2 mm tick spacing 2.0 mm (at base) color 100% red rectangle height .875 mm rectangle width 1.0 mm	May also be shown in magenta, black, or other colors.
18.55	Small cone, vent, cinder cone, or spatter cone		lineweight .2 mm color 100% red asterisk height 2.0 mm asterisk width 2.0 mm asterisk angle 60°	May also be shown in magenta, black, or other colors.
18.56	Large cone, vent, cinder cone, or spatter cone		lineweight .2 mm color 100% red asterisk height 2.625 mm asterisk width 2.625 mm asterisk angle 60°	
18.57	Small hornito		lineweight .2 mm color 100% red asterisk height 2.0 mm asterisk width 2.0 mm asterisk angle 45°	
18.58	Large hornito		lineweight .2 mm color 100% red asterisk height 2.625 mm asterisk width 2.625 mm asterisk angle 45°	
18.59	Spatter rampart		lineweight .2 mm color 100% red rectangle height .5 mm rectangle width 1.5 mm rectangle spacing 2.0 mm rectangle length 90°	
18.60	Rootless vent area on lava flow		lineweight .2 mm line color 100% red pattern 327-R	
18.61	Thermal area		lineweight .2 mm line color 100% red pattern 121-R in 50% red	Rotate tail to downhill. May also be shown in magenta or other colors.
18.62	Thermal spring		color 100% red dot diameter 1.5 mm radius .5 mm lineweight .15 mm radius .5 mm dot spacing 2.0 mm	
18.63	Geyser		lineweight .2 mm lineweight .375 mm lineweight .2 mm color 100% red radius .5 mm ellipse height 2.75 mm ellipse height 1.25 mm width 2.5 mm	
18.64	Fumarole or steam vent		draft as shown 2.5 mm color 100% red ellipse height 1.25 mm width 2.5 mm	
18.65	Recent volcano on small-scale maps		all lineweights .2 mm color 100% red outer diameter 3.0 mm inner diameter 1.375 mm angle 22.5°	
18.66	Active volcano on small-scale maps		lineweight .3 mm color 100% red angle 60°	Usually reserved for maps at scales of 1:250,000 or smaller. May also be shown in magenta, black, or other colors.
18.67	Inactive volcano on small-scale maps		color 100% red lineweight .3 mm angle 90°	
18.68	Cinder cone on small-scale maps		circle diameter 1.375 mm lineweight .2 mm color 100% red	
18.69	Diatreme		dot diameter 1.375 mm color 100% red angle H-7	
18.70	Breccia pipe		dot diameter 1.375 mm color 100% red angle H-7	
18.71	Collapse structure—Indicating breccia pipe at depth		lineweight .2 mm circle diameter 1.375 mm color 100% red angle H-7	

*For more information, see general guidelines on pages A-i to A-v.

19—NATURAL RESOURCES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
19.1—Veins and mineralized areas; mineral resource areas; metamorphic facies boundary				
19.1.1	Vein, veinlet, or mineralized stringer—Identity and existence certain, location accurate		lineweight .25 mm color 100% red → 8.0 mm ← H-8 ? .75 mm	May also be shown in black or other colors.
19.1.2	Vein, veinlet, or mineralized stringer—Identity or existence questionable, location accurate		dot diameter .75 mm; spacing 4.5 mm	
19.1.3	Vein, veinlet, or mineralized stringer—Identity and existence certain, location approximate		3.625 mm ? .75 mm	
19.1.4	Vein, veinlet, or mineralized stringer—Identity or existence questionable, location approximate		.75 mm .75 mm	
19.1.5	Vein, veinlet, or mineralized stringer—Identity and existence certain, location concealed		.5 mm .75 mm	Place tick, arrow, or other line-symbol decoration where observation was made. Add arrowhead or '90' to ticks showing dip if necessary for clarity.
19.1.6	Vein, veinlet, or mineralized stringer—Identity or existence questionable, location concealed		.75 mm .75 mm	
19.1.7	Vein, veinlet, or mineralized stringer—Showing type of mineral occurrence		Cu ← H-8 (100% black)	
19.1.8	Inclined vein, veinlet, or mineralized stringer (1st option)—Showing dip value and direction		tick length 1.75 mm; lineweight .2 mm 35 ← H-6 (100% black) tick color 100% black	
19.1.9	Inclined vein, veinlet, or mineralized stringer (2nd option)—Showing dip value and direction		tick length 1.375 mm; lineweight .2 mm 15 .875 mm 30°	May also be shown in black or other colors.
19.1.10	Vertical or near-vertical vein, veinlet, or mineralized stringer (1st option)		tick length 2.5 mm; lineweight .2 mm	
19.1.11	Vertical or near-vertical vein, veinlet, or mineralized stringer (2nd option)		90 ← H-6 (100% black)	
19.1.12	Small, minor inclined vein, veinlet, or mineralized stringer—Showing strike and dip		H-6 (100% black) 70 lineweight .25 mm; line color 100% red 1.25 mm 5.5 mm	
19.1.13	Small, minor vertical or near-vertical vein, veinlet, or mineralized stringer—Showing strike		2.5 mm	Add labels to show specific types of alteration. May be used alone or may overprint other mapped units. May also be shown in black or other colors.
19.1.14	Zone of mineralized or altered rock (1st option)		pattern 405-R (at 45°)	
19.1.15	Zone of mineralized or altered rock (2nd option)		pattern 405-R in 50% red (at 45°)	
19.1.16	Zone of mineralized or altered rock, showing high level of mineralization		pattern 119-R	
19.1.17	Zone of mineralized or altered rock, showing low level of mineralization		pattern 117-R	Usually reserved for use on special-purpose maps, not on general-purpose geologic maps. Generally shown in red, but may also be shown in black or other colors.
19.1.18	Area of identified resources		lineweight .5 mm color 100% red	
19.1.19	Area of high mineral resource potential		lineweight .3 mm line and text color 100% red H-12 pattern 427-R in 50% red	
19.1.20	Area of moderate mineral resource potential		lineweight .3 mm H-12 pattern 229-R (at 45°) in 50% red	
19.1.21	Area of low mineral resource potential		lineweight .2 mm H-10	May also be shown in black or other colors.
19.1.22	Area considered to have mineral resource potential but not evaluated, mostly because of inadequate data		lineweight .2 mm H-10 dash 1.75 mm; space .5 mm	
19.1.23	Metamorphic facies boundary—Showing approximate boundary between diagnostic mineral assemblages		H-8 Greenschist Amphibolite dot diameter .5 mm; spacing .5 mm line and text color 100% red	

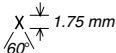

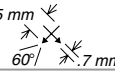



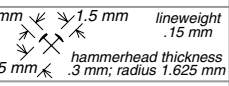





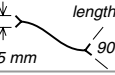



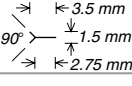





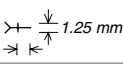

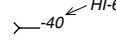

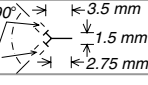





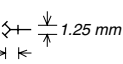

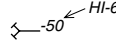

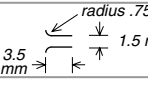







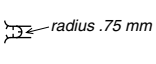

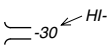
*For more information, see general guidelines on pages A-i to A-v.

19—NATURAL RESOURCES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
19.2—Areas of extensively disturbed ground; surface workings; subsurface workings projected to surface				
19.2.1	Graded area—Extensive amount of mapped geologic unit has been removed		lineweight .2 mm line color 100% red pattern 226-R (at 45°)	Patterns should overlay other mapped units. Generally shown in black or red, but may also be shown in brown or other colors.
19.2.2	Strip mine (1st option)		lineweight .3 mm lineweight .15 mm pattern 226-K (at 45°)	
19.2.3	Strip mine (2nd option)		pattern 419-R in 50% red	
19.2.4	Artificial fill—Earth materials		lineweight .15 mm H-8 20% black	Show as separately mapped units. Generally shown in black or red, but may also be shown in other colors.
19.2.5	Artificial fill—Human-generated refuse (landfill)		lineweight .15 mm H-8 pattern 226-R (at 45°)	
19.2.6	Tailings		lineweights .125 mm draft as shown	Symbols should overlay other mapped units. Generally shown in red or black, but may also be shown in brown or other colors.
19.2.7	Mine dump (1st option)		all lineweights .125 mm dash length and spacing may vary draft as shown	
19.2.8	Mine dump (2nd option)		all lineweights .125 mm dash length and spacing may vary draft as shown	
19.2.9	Mine dump bench		.75 mm 2.5 mm all lineweights .125 mm	Different symbols may be used to show different levels of workings. Symbols should overlay other mapped units. Generally shown in red, but may also be shown in black or other colors.
19.2.10	Subsurface workings, projected to surface (1st option)		color 100% red lineweights .2 mm spacing may vary	
19.2.11	Subsurface workings, projected to surface (2nd option)		dash 3.0 mm; spacing .5 mm	
19.2.12	Subsurface workings, projected to surface (3rd option)		dash 1.5 mm; spacing .5 mm	
19.2.13	Subsurface workings, projected to surface (4th option)		dash .5 mm; spacing .5 mm	
19.2.14	Subsurface workings, projected to surface (5th option)		long dash 2.5 mm; short dashes .5 mm; spacing .5 mm	
19.2.15	Subsurface workings, projected to surface (6th option)		long dash 4.0 mm; short dash .5 mm; spacing .5 mm	

*For more information, see general guidelines on pages A-i to A-v.

19—NATURAL RESOURCES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
19.3—Mining and mineral exploration (at surface)				
19.3.1	Prospect (pit or small open cut)	X	lineweight .2 mm 	
19.3.2	Sand, gravel, clay, or placer pit		3.125 mm all lineweights .15 mm 	
19.3.3	Abandoned sand, gravel, clay, or placer pit		all lineweights .15 mm 	
19.3.4	Open pit, quarry, or glory hole		pick thickness .25 mm; radius 1.625 mm 1.5 mm 3.125 mm lineweight .15 mm hammerhead thickness .3 mm; radius 1.625 mm 	
19.3.5	Abandoned open pit, quarry, or glory hole		all lineweights .15 mm 	
19.3.6	Open pit or quarry (mapped to scale)		all lineweights .25 mm  hachure height .6 mm; spacing 1.5 mm	
19.3.7	Trench (generalized trace)		1.5 mm all lineweights .25 mm length may vary 90° 	
19.3.8	Trench (drawn to scale)		all lineweights .25 mm  hachure height .6 mm; spacing 1.5 mm	
19.3.9	Adit or tunnel entrance (1st option)		all lineweights .175 mm 90° 3.5 mm 1.5 mm 2.75 mm 	Long line points in direction of adit or tunnel entrance at surface.
19.3.10	Approximately located adit or tunnel entrance (1st option)		1.0 mm .25 mm 	Map position of adit or tunnel entrance is at intersection of long line and two short lines.
19.3.11	Destroyed adit or tunnel entrance (1st option)		.25 mm 2.5 mm 	
19.3.12	Abandoned or inaccessible adit or tunnel entrance (1st option)		all lineweights .175 mm 1.75 mm 1.25 mm 	
19.3.13	Adit or tunnel entrance (1st option)—Showing angle of inclination (negative value indicates downward slope)		HI-6 -40 	Angle of inclination may be added to any adit or tunnel entrance symbol.
19.3.14	Adit or tunnel entrance (2nd option)		all lineweights .175 mm 90° 3.5 mm 1.5 mm 2.75 mm 1.0 mm 	Long line points in direction of adit or tunnel entrance at surface.
19.3.15	Approximately located adit or tunnel entrance (2nd option)		1.0 mm .25 mm 	Map position of adit or tunnel entrance is at intersection of long line and two short lines.
19.3.16	Destroyed adit or tunnel entrance (2nd option)		.25 mm 2.5 mm 	
19.3.17	Abandoned or inaccessible adit or tunnel entrance (2nd option)		all lineweights .175 mm 1.75 mm 1.25 mm 	
19.3.18	Adit or tunnel entrance (2nd option)—Showing angle of inclination (negative value indicates downward slope)		HI-6 -50 	Angle of inclination may be added to any adit or tunnel entrance symbol.
19.3.19	Portal		all lineweights .175 mm radius .75 mm 3.5 mm 1.5 mm 	Long lines point in direction of portal entry at surface.
19.3.20	Approximately located portal		1.0 mm .25 mm 	Map position of portal entry is between the two lines, at the position where the short curved lines intersect the long lines.
19.3.21	Destroyed portal		.25 mm 2.5 mm 	
19.3.22	Abandoned or inaccessible portal		all lineweights .175 mm 1.75 mm 	
19.3.23	Portal and open cut		all lineweights .175 mm tick length .5 mm radius .75 mm 	Open cut may be added to any portal symbol.
19.3.24	Portal—Showing angle of inclination (negative value indicates downward slope)		HI-6 -30 	Angle of inclination may be added to any portal symbol.

19—NATURAL RESOURCES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
19.3—Mining and mineral exploration (at surface) (continued)				
19.3.25	Drill hole for mineral exploration	○	lineweight .175 mm ○ diameter 1.5 mm	
19.3.26	Drill hole for mineral exploration—No geologic data available	○ ND	○ ND ← H-6	
19.3.27	Drill hole for mineral exploration—Showing name and number	○ PAHUTE 2	○ PAHUTE 2 ← H-7	
19.3.28	Drill hole for mineral exploration—Showing type (DDH, diamond drill hole)	DDH ○	HI-6 → DDH ○	
19.3.29	Drill hole for exploration of low-grade ore	⊕	all lineweights .175 mm ⊕ 4.0 mm	
19.3.30	Drill hole for exploration of high-grade ore	⊙	⊙ 4.0 mm	Projected trace of drill hole, angle of inclination, surface altitude, and total depth may be added to any drill hole symbol.
19.3.31	Inclined drill hole for mineral exploration—Showing location of collar (circle) and projected trace (dashed line) and bottom (T) of drill hole	○-----T	all lineweights .175 mm length may vary ○-----T 1.0 mm 1.5 mm	
19.3.32	Inclined drill hole for mineral exploration—Showing angle of inclination (negative value indicates downward slope)	○-----T ⁻⁶⁵	○-----T ⁻⁶⁵ ← HI-6	
19.3.33	Inclined drill hole for mineral exploration—Showing surface altitude of collar (in meters)	2500 ○-----T	HI-6 → 2500 ○-----T	
19.3.34	Inclined drill hole for mineral exploration—Showing total depth of drill hole (in meters)	○-----T ^{TD 1000}	○-----T ^{TD 1000} ← HI-6	
19.3.35	Vertical mine shaft, as shown on smaller scale or general-purpose maps	■	lineweight .175 mm ■ 1.5 mm	
19.3.36	Multiple vertical mine shafts, as shown on smaller scale or general-purpose maps	■■■	■■■	
19.3.37	Abandoned or inaccessible vertical mine shaft, as shown on smaller scale or general-purpose maps	■ ^A	■ ^A ← H-7	
19.3.38	Inclined mine shaft, as shown on smaller scale or general-purpose maps—Showing direction of inclination	⊥	all lineweights .175 mm ⊥ 1.0 mm	
19.3.39	Inclined mine shaft, as shown on smaller scale or general-purpose maps—Showing angle of inclination (negative value indicates downward slope)	⊥ ⁻²⁵	⊥ ⁻²⁵ ← HI-6	




















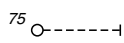

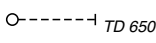

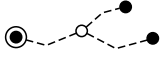
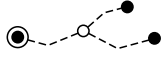
*For more information, see general guidelines on pages A-i to A-v.

19—NATURAL RESOURCES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
19.4—Mines and subsurface workings				
19.4.1	Vertical mine shaft at surface (drawn to scale), as shown on subsurface exploration maps		size may vary lineweight .175 mm	
19.4.2	Inclined mine shaft at surface (drawn to scale), as shown on subsurface exploration maps—Showing direction of inclination		all lineweights .175 mm lengths may vary	
19.4.3	Inclined mine shaft at surface (drawn to scale), as shown on subsurface exploration maps—Showing angle of inclination (negative value indicates downward slope)		-30 HI-6	
19.4.4	Mine shaft, above and below level (drawn to scale), as shown on subsurface exploration maps		size may vary all lineweights .175 mm	
19.4.5	Bottom of mine shaft (drawn to scale), as shown on subsurface exploration maps		size may vary all lineweights .175 mm	
19.4.6	Winze or head of raise (drawn to scale), as shown on subsurface exploration maps		size may vary all lineweights .175 mm	
19.4.7	Raise or winze extending through level (drawn to scale), as shown on subsurface exploration maps		size may vary all lineweights .175 mm	
19.4.8	Raise or foot of winze (drawn to scale), as shown on subsurface exploration maps		size may vary all lineweights .175 mm	
19.4.9	Crosscut tunnel or intersection of workings (drawn to scale), as shown on subsurface exploration maps		radius 1.25 mm lineweight .175 mm	size may vary
19.4.10	Workings (drawn to scale), as shown on subsurface exploration maps		spacing may vary lineweights .175 mm	
19.4.11	Caved or otherwise inaccessible workings (drawn to scale), as shown on subsurface exploration maps		all lineweights .175 mm length of crossbar may vary dash 1.5 mm; spacing .5 mm	spacing may vary
19.4.12	Inclined workings, as shown on subsurface exploration maps (drawn to scale)—Chevrons point down-slope (multiple chevrons indicate steeper slope)		all lineweights .175 mm spacing may vary 90°	
19.4.13	Ore chute (drawn to scale), as shown on subsurface exploration maps		1.5 mm spacing may vary all lineweights .15 mm	
19.4.14	Lagging or cribbing along drift (drawn to scale), as shown on subsurface exploration maps		all lineweights .15 mm spacing may vary circle diameter .75 mm; spacing .75 mm	
19.4.15	Elevation of roof or back, as shown on subsurface exploration maps		1.0 mm 60° 2801' HI-6	all lineweights .15 mm
19.4.16	Elevation of floor or sill, as shown on subsurface exploration maps		1.0 mm HI-6 2809' 60°	
19.4.17	Stoped area (drawn to scale), as shown on subsurface exploration maps (section view)		all lineweights .15 mm dash 1.5 mm; spacing .5 mm	
19.4.18	Inferred stoped area (drawn to scale), as shown on subsurface exploration maps (section view)		pattern 226-K (at 45°) dash .3 mm; spacing .3 mm	


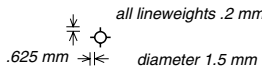
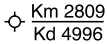
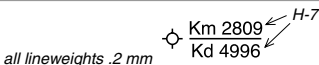





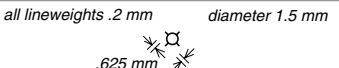



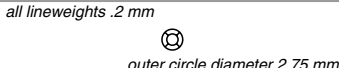

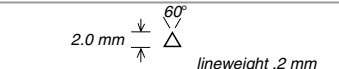

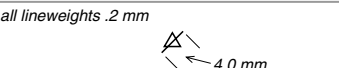





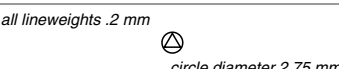

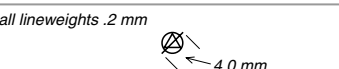

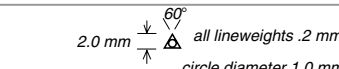

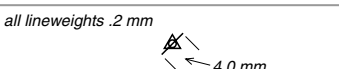





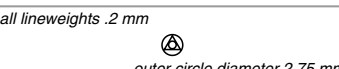

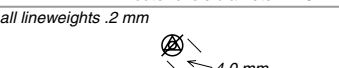
*For more information, see general guidelines on pages A-i to A-v.

19—NATURAL RESOURCES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
19.5—Oil and gas fields; wells drilled for hydrocarbon exploration or exploitation				
19.5.1	Oil field—Extent defined		lineweight .2 mm fill color 50% green line color 100% green	Patterned areas (extent defined) should be shown as separately mapped units. Outlined areas (extent not yet defined) should overlay other mapped units. Generally shown in red and (or) green, but may also be shown in other colors or patterns.
19.5.2	Oil field—Extent not yet defined		lineweight .2 mm dash .5 mm; spacing .5 mm line color 50% green	
19.5.3	Gas field—Extent defined		lineweight .2 mm fill color 50% red line color 100% red	
19.5.4	Gas field—Extent not yet defined		lineweight .2 mm dash 2.0 mm; spacing .5 mm line color 100% red	
19.5.5	Oil and gas field—Extent defined		lineweight .2 mm pattern 426 (at 45°)	
19.5.6	Oil and gas field—Extent not yet defined		lineweight .2 mm long dash 2.0 mm; short dash .5 mm; space .5 mm	
19.5.7	Core (nonspecific depth)		lineweight .2 mm dot diameter .5 mm 1.75 mm	May also be shown in other colors.
19.5.8	Shallow core			Use if both shallow and deep cores are shown on map.
19.5.9	Deep core		all lineweights .2 mm circle diameter 2.75 mm	May also be shown in other colors.
19.5.10	Drilling well or well location for hydrocarbon exploration or exploitation		lineweight .2 mm diameter 1.5 mm	Name, number, and total depth may be added to any type of well symbol.
19.5.11	Drill hole for hydrocarbon exploration or exploitation—No data available			May also be shown in green (oil), red (gas), or other colors.
19.5.12	Drill hole for hydrocarbon exploration or exploitation—Showing name and number			
19.5.13	Drill hole for hydrocarbon exploration or exploitation—Showing total depth (in meters)			
19.5.14	Inclined drill hole for hydrocarbon exploration or exploitation—Showing location of collar (circle) and projected trace (dashed line) and bottom (T) of drill hole		all lineweights .2 mm length of trace may vary 1.0 mm 1.5 mm 5 mm	Projected trace of drill hole, angle of inclination, surface altitude, and total depth may be added to any type of well symbol. May also be shown in green (oil), red (gas), or other colors.
19.5.15	Inclined drill hole for hydrocarbon exploration or exploitation—Showing angle of inclination			
19.5.16	Inclined drill hole for hydrocarbon exploration or exploitation—Showing surface altitude of collar (in meters)			
19.5.17	Inclined drill hole for hydrocarbon exploration or exploitation—Showing total depth of drill hole (in meters)			
19.5.18	Multiple wells drilled from single platform—Showing location of collar (open circle) on platform. Types of wells indicated at drill hole bottoms			Any type of well symbol may be shown at bottoms of drill holes.

*For more information, see general guidelines on pages A-i to A-v.

19—NATURAL RESOURCES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
19.5—Oil and gas fields; wells drilled for hydrocarbon exploration or exploitation (continued)				
19.5.19	Dry hole (nonspecific depth)			May also be shown in other colors.
19.5.20	Dry hole—Showing map unit at surface (Km) and at bottom of hole (Kd). Also showing altitude at surface and total depth of hole (in meters)			
19.5.21	Shallow dry hole			Use if both shallow and deep dry holes are shown on map.
19.5.22	Deep dry hole			May also be shown in other colors.
19.5.23	Junked hole (nonspecific depth)			May also be shown in other colors.
19.5.24	Shallow junked hole			Use if both shallow and deep junked holes are shown on map.
19.5.25	Deep junked hole			May also be shown in other colors.
19.5.26	Disposal well (nonspecific depth)			May also be shown in other colors.
19.5.27	Plugged and abandoned disposal well (nonspecific depth)			
19.5.28	Shallow disposal well			Use if both shallow and deep disposal wells are shown on map.
19.5.29	Plugged and abandoned shallow disposal well			May also be shown in other colors.
19.5.30	Deep disposal well			
19.5.31	Plugged and abandoned deep disposal well			
19.5.32	Salt-water disposal well (nonspecific depth)			May also be shown in other colors.
19.5.33	Plugged and abandoned salt-water disposal well (nonspecific depth)			
19.5.34	Shallow salt-water disposal well			Use if both shallow and deep salt-water disposal wells are shown on map.
19.5.35	Plugged and abandoned shallow salt-water disposal well			May also be shown in other colors.
19.5.36	Deep salt-water disposal well			
19.5.37	Plugged and abandoned deep salt-water disposal well			

*For more information, see general guidelines on pages A-i to A-v.

19—NATURAL RESOURCES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
19.5—Oil and gas fields; wells drilled for hydrocarbon exploration or exploitation (continued)				
19.5.38	Oil seep		lineweight .2 mm diameter 1.5 mm	May also be shown in green or other colors.
19.5.39	Oil show		lineweight .2 mm diameter 1.5 mm	
19.5.40	Oil well (nonspecific depth)		diameter 1.5 mm	
19.5.41	Suspended oil well (nonspecific depth)		lineweight .2 mm 4.0 mm	
19.5.42	Plugged and abandoned oil well (nonspecific depth)		lineweight .2 mm 4.0 mm	
19.5.43	Shallow oil well			Use if both shallow and deep oil wells are shown on map.
19.5.44	Suspended shallow oil well			May also be shown in green or other colors.
19.5.45	Plugged and abandoned shallow oil well			
19.5.46	Deep oil well		lineweight .2 mm inner dot diameter 1.5 mm outer circle diameter 2.75 mm	
19.5.47	Suspended deep oil well		all lineweights .2 mm 4.0 mm	
19.5.48	Plugged and abandoned deep oil well		all lineweights .2 mm 4.0 mm	
19.5.49	Gas seep		all lineweights .2 mm 90° 90° 1.2 mm diameter 1.5 mm	May also be shown in red or other colors.
19.5.50	Gas show		all lineweights .2 mm 6.25 mm diameter 1.5 mm	
19.5.51	Gas well (nonspecific depth)		all lineweights .2 mm 6.25 mm diameter 1.5 mm	
19.5.52	Suspended gas well (nonspecific depth)		all lineweights .2 mm 4.0 mm	
19.5.53	Plugged and abandoned gas well (nonspecific depth)		all lineweights .2 mm 4.0 mm	
19.5.54	Shallow gas well			Use if both shallow and deep gas wells are shown on map.
19.5.55	Suspended shallow gas well			May also be shown in red or other colors.
19.5.56	Plugged and abandoned shallow gas well			
19.5.57	Deep gas well		inner circle diameter 1.5 mm; outer circle diameter 2.75 mm all lineweights .2 mm 6.25 mm	
19.5.58	Suspended deep gas well		all lineweights .2 mm 4.0 mm	
19.5.59	Plugged and abandoned deep gas well		all lineweights .2 mm 4.0 mm	
19.5.60	Deep gas well, plugged back and producing shallow gas		all lineweights .2 mm 1.25 mm	May also be shown in red or other colors.

*For more information, see general guidelines on pages A-i to A-v.

19—NATURAL RESOURCES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
19.5—Oil and gas fields; wells drilled for hydrocarbon exploration or exploitation (continued)				
19.5.61	Oil and gas seep		all lineweights .2 mm 90° 90° 1.2 mm .625 mm diameter 1.5 mm	May also be shown in other colors.
19.5.62	Oil and gas show		all lineweights .2 mm .625 mm diameter 1.5 mm	
19.5.63	Oil and gas well (nonspecific depth)		all lineweights .2 mm diameter 1.5 mm .625 mm	
19.5.64	Suspended oil and gas well (nonspecific depth)		all lineweights .2 mm 4.0 mm	
19.5.65	Plugged and abandoned oil and gas well (nonspecific depth)		all lineweights .2 mm 4.0 mm	
19.5.66	Shallow oil and gas well			Use if both shallow and deep oil and gas wells are shown on map. May also be shown in other colors.
19.5.67	Suspended shallow oil and gas well			
19.5.68	Plugged and abandoned shallow oil and gas well			
19.5.69	Deep oil and gas well		inner dot diameter 1.5 mm; outer circle diameter 2.75 mm all lineweights .2 mm .625 mm	
19.5.70	Suspended deep oil and gas well		all lineweights .2 mm 4.0 mm	
19.5.71	Plugged and abandoned deep oil and gas well		all lineweights .2 mm 4.0 mm	May also be shown in other colors.
19.5.72	Condensate show		lineweight .2 mm diameter 1.5 mm	
19.5.73	Condensate well (nonspecific depth)		lineweight .2 mm diameter 1.5 mm	
19.5.74	Suspended condensate well (nonspecific depth)		lineweight .2 mm 4.0 mm	
19.5.75	Plugged and abandoned condensate well (nonspecific depth)		lineweight .2 mm 4.0 mm	
19.5.76	Shallow condensate well			Use if both shallow and deep condensate wells are shown on map. May also be shown in other colors.
19.5.77	Suspended shallow condensate well			
19.5.78	Plugged and abandoned shallow condensate well			
19.5.79	Deep condensate well		all lineweights .2 mm inner dot diameter 1.5 mm outer circle diameter 2.75 mm	
19.5.80	Suspended deep condensate well		all lineweights .2 mm 4.0 mm	
19.5.81	Plugged and abandoned deep condensate well		all lineweights .2 mm 4.0 mm	


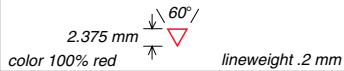

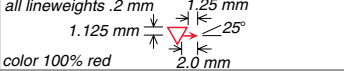

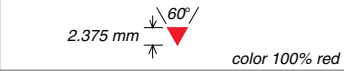










*For more information, see general guidelines on pages A-i to A-v.

19—NATURAL RESOURCES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
19.5—Oil and gas fields; wells drilled for hydrocarbon exploration or exploitation (continued)				
19.5.82	Gas and condensate show		all lineweights .2 mm diameter 1.5 mm 	May also be shown in other colors.
19.5.83	Gas and condensate well (nonspecific depth)		all lineweights .2 mm diameter 1.5 mm 	
19.5.84	Suspended gas and condensate well (nonspecific depth)		all lineweights .2 mm diameter 1.5 mm 	
19.5.85	Plugged and abandoned gas and condensate well (nonspecific depth)		all lineweights .2 mm diameter 1.5 mm 	
19.5.86	Shallow gas and condensate well			Use if both shallow and deep gas and condensate wells are shown on map. May also be shown in other colors.
19.5.87	Suspended shallow gas and condensate well			
19.5.88	Plugged and abandoned shallow gas and condensate well			
19.5.89	Deep gas and condensate well		inner circle diameter 1.5 mm; outer circle diameter 2.75 mm all lineweights .2 mm 	
19.5.90	Suspended deep gas and condensate well		all lineweights .2 mm diameter 1.5 mm 	May also be shown in other colors.
19.5.91	Plugged and abandoned deep gas and condensate well		all lineweights .2 mm diameter 1.5 mm 	
19.5.92	Gas storage well (nonspecific depth)		1.75 mm 	
19.5.93	Plugged and abandoned gas storage well (nonspecific depth)		lineweight .2 mm diameter 1.5 mm 	
19.5.94	Shallow gas storage well			Use if both shallow and deep gas storage wells are shown on map. May also be shown in other colors.
19.5.95	Plugged and abandoned shallow gas storage well			
19.5.96	Deep gas storage well		lineweight .2 mm outer circle diameter 2.75 mm 	
19.5.97	Plugged and abandoned deep gas storage well		all lineweights .2 mm diameter 1.5 mm 	
19.5.98	Observation well for gas-storage field (nonspecific depth)		diameter 1.5 mm all lineweights .2 mm 	May also be shown in other colors.
19.5.99	Plugged and abandoned observation well for gas-storage field [nonspecific depth]		all lineweights .2 mm diameter 1.5 mm 	
19.5.100	Shallow observation well for gas-storage field			
19.5.101	Plugged and abandoned shallow observation well for gas-storage field			
19.5.102	Deep observation well for gas-storage field		all lineweights .2 mm outer circle diameter 2.75 mm 	Use if both shallow and deep observation wells are shown on map. May also be shown in other colors.
19.5.103	Plugged and abandoned deep observation well for gas-storage field		all lineweights .2 mm diameter 1.5 mm 	

*For more information, see general guidelines on pages A-i to A-v.

20—HAZARDOUS WASTE SITES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
20.1	Hazardous waste site		 2.375 mm color 100% red line weight .2 mm 60° 1.125 mm	Generally shown in red, but may also be shown in black or other colors.
20.2	Hazardous waste site—Showing direction of surface-leachate flow from site		 all line weights .2 mm 1.125 mm color 100% red 1.25 mm 25° 2.0 mm	
20.3	Active (operating) hazardous waste site		 2.375 mm color 100% red line weight .2 mm 60° 1.125 mm	
20.4	Inactive (closed) hazardous waste site		 triangle line weight .2 mm bar line weight .3 mm color 100% red 3.75 mm line weight .2 mm 60° 1.125 mm	
20.5	Hazardous waste site—Clean-up activities are in progress		 color 100% red line weight .25 mm 60° 1.125 mm	
20.6	Hazardous waste site—Clean-up activities have been completed		 color 100% red line weight .25 mm 60° 1.125 mm	
20.7	Hazardous waste site, showing smaller restricted area (mapped to scale)		 line weight .25 mm color 100% red 1.5 mm 1.5 mm pattern 226-R (at 45°)	
20.8	Hazardous waste site, showing larger restricted area (mapped to scale)		 1.5 mm 1.5 mm pattern 226-R (at 45°)	

*For more information, see general guidelines on pages A-i to A-v.

21—NEOTECTONIC AND EARTHQUAKE-HAZARD FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
21.1	Earthquake epicenter, magnitude 7.5 or larger		color 100% violet outer circle diameter 7.0 mm; inner circle diameter 5.75 mm; linewidth .25 mm inner dot diameter 4.5 mm	The type of scale used for measuring earthquakes should be noted. May also be shown in black or other colors.
21.2	Earthquake epicenter, magnitude 7–7.49		color 100% violet dot diameter 4.25 mm	
21.3	Earthquake epicenter, magnitude 6.5–6.99		color 100% violet inner dot diameter 2.375 mm circle diameter 4.0 mm; linewidth .25 mm	
21.4	Earthquake epicenter, magnitude 6–6.49		color 100% violet dot diameter 2.25 mm	
21.5	Earthquake epicenter, magnitude 5.5–5.99		color 100% violet circle diameter 2.25 mm; linewidth .25 mm	
21.6	Earthquake epicenter, magnitude 4–5.49		color 100% violet circle diameter 1.4 mm; linewidth .225 mm	
21.7	Earthquake epicenter, magnitude less than 4		color 100% violet circle diameter .875 mm; linewidth .2 mm	
21.8	Fault-plane or focal-mechanism diagram for vertical, down-to-the-left offset along north-striking, vertical fault—Black quadrant indicates region of compression		size may vary linewidth .175 mm	Note that two types of fault motion and (or) two different fault-plane orientations could be represented by the same focal-mechanism diagram. For example, the focal-mechanism diagram that shows right-lateral strike-slip offset along a north-striking, vertical fault (ref. no. 21.9) could also show left-lateral strike-slip offset along an east-west-striking, vertical fault.
21.9	Fault-plane or focal-mechanism diagram for right-lateral strike-slip offset along north-striking, vertical fault—Black quadrants indicate regions of compression			
21.10	Fault-plane or focal-mechanism diagram for left-lateral strike-slip offset along north-striking, vertical fault—Black quadrants indicate regions of compression			
21.11	Fault-plane or focal-mechanism diagram for normal, down-to-the-left offset along north-striking, west-dipping (at 45°) fault—Black quadrants indicate regions of compression			
21.12	Fault-plane or focal-mechanism diagram for normal, down-to-the-left offset along northwest-striking, southwest-dipping (at 30°) fault—Black quadrants indicate regions of compression			
21.13	Fault-plane or focal-mechanism diagram for reverse, left-side-up offset along north-striking, west-dipping (at 45°) fault—Black quadrant indicates region of compression			
21.14	Fault-plane or focal-mechanism diagram for reverse, left-side-up offset along northwest-striking, southwest-dipping (at 60°) fault—Black quadrant indicates region of compression			
21.15	Fault-plane or focal-mechanism diagram for oblique reverse, left-side-up offset along northwest-striking, southwest-dipping (at 60°) fault—Black quadrants indicate regions of compression			May also be shown in purple or other colors.
21.16	Outer limit of subsidence caused by shock—Identity and existence certain, location accurate. Hachures point into subsided area		all linewidths .275 mm H-8 12.0 mm 1.25 mm 1.75 mm	
21.17	Outer limit of subsidence caused by shock—Identity or existence questionable, location accurate. Hachures point into subsided area			
21.18	Outer limit of subsidence caused by shock—Identity or existence certain, location approximate. Hachures point into subsided area		3.5 mm 1.25 mm 1.75 mm	
21.19	Outer limit of subsidence caused by shock—Identity or existence questionable, location approximate. Hachures point into subsided area		.75 mm .75 mm	
21.20	Outer limit of subsidence caused by shock—Identity or existence certain, location inferred. Hachures point into subsided area		1.5 mm 1.25 mm 1.75 mm	
21.21	Outer limit of subsidence caused by shock—Identity or existence questionable, location inferred. Hachures point into subsided area		.75 mm .75 mm	
21.22	Outer limit of subsidence caused by shock—Identity and existence certain, location concealed. Hachures point into subsided area		.75 mm 1.25 mm 1.75 mm	
21.23	Outer limit of subsidence caused by shock—Identity or existence questionable, location concealed. Hachures point into subsided area		.75 mm .75 mm	

*For more information, see general guidelines on pages A-i to A-v.

21—NEOTECTONIC AND EARTHQUAKE-HAZARD FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*	
21.24	Rim crest or crater with rim, formed by shock or sand blowouts—Identity and existence certain, location accurate. Hachures point into crater		<i>all lineweights .2 mm</i> 	May also be shown in purple or other colors.	
21.25	Rim crest or crater with rim, formed by shock or sand blowouts—Identity or existence questionable, location accurate. Hachures point into crater				
21.26	Rim crest or crater with rim, formed by shock or sand blowouts—Identity or existence certain, location approximate. Hachures point into crater		<i>3.5 mm</i> 		
21.27	Rim crest or crater with rim, formed by shock or sand blowouts—Identity or existence questionable, location approximate. Hachures point into crater				
21.28	Rim crest or crater with rim, formed by shock or sand blowouts—Identity and existence certain, location concealed. Hachures point into crater		<i>1.25 mm</i> 		
21.29	Rim crest or crater with rim, formed by shock or sand blowouts—Identity or existence questionable, location concealed. Hachures point into crater				
21.30	Sinkhole or crater without rim, formed by shock—Identity and existence certain, location accurate. Hachures point into sinkhole		<i>all lineweights .2 mm</i> 		
21.31	Sinkhole or crater without rim, formed by shock—Identity or existence questionable, location accurate. Hachures point into sinkhole				
21.32	Sinkhole or crater without rim, formed by shock—Identity or existence certain, location approximate. Hachures point into sinkhole		<i>3.5 mm</i> 		
21.33	Sinkhole or crater without rim, formed by shock—Identity or existence questionable, location approximate. Hachures point into sinkhole				
21.34	Sinkhole or crater without rim, formed by shock—Identity or existence certain, location concealed. Hachures point into sinkhole		<i>.5 mm</i> 		
21.35	Sinkhole or crater without rim, formed by shock—Identity or existence questionable, location concealed. Hachures point into sinkhole				
21.36	Fissures or cracks, formed in ground by earthquake		<i>lineweights .2 mm</i> 	lengths and spacing may vary	
21.37	Fissures and sand and (or) other material ejected during earthquake		<i>lineweights .3 mm</i> 	lengths and spacing may vary	

*For more information, see general guidelines on pages A-i to A-v.

22—PLATE-TECTONIC FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
22.1	Active spreading axis or mid-oceanic ridge, with rift—Accurately located. Sawteeth point in direction of spreading		color 100% red 1.25 mm 60° lineweight .375 mm spacing may vary sawtooth lineweight .25 mm; spacing 12.5 mm	May also be shown in black or other colors.
22.2	Active spreading axis or mid-oceanic ridge, with rift—Approximately located. Sawteeth point in direction of spreading		10.0 mm 2.5 mm	
22.3	Active spreading axis or mid-oceanic ridge, without rift—Accurately located. Sawteeth point in direction of spreading		color 100% red 1.25 mm 60° lineweight .625 mm sawtooth lineweight .25 mm; spacing 12.5 mm	
22.4	Active spreading axis or mid-oceanic ridge, without rift—Approximately located. Sawteeth point in direction of spreading		10.0 mm 2.5 mm	
22.5	Ancient spreading axis or mid-oceanic ridge—Accurately located. Sawteeth point in direction of spreading		1.25 mm 60° all lineweights .25 mm 75 mm sawtooth spacing 12.5 mm	May also be shown in other colors.
22.6	Ancient spreading axis or mid-oceanic ridge—Approximately located. Sawteeth point in direction of spreading		10.0 mm 2.5 mm	
22.7	Surface trace of active deep-seismofocal or subduction zone—Accurately located. Sawteeth on upper plate		lineweight .375 mm 1.25 mm 6.25 mm color 100% red sawtooth radius 3.0 mm	May also be shown in black or other colors.
22.8	Surface trace of active deep-seismofocal or subduction zone—Approximately located. Sawteeth on upper plate		5.25 mm 1.0 mm	
22.9	Surface trace of active deep-seismofocal or subduction zone—Showing fore-arc sediments. Sawteeth on upper plate		pattern 427-R	
22.10	Active convergent plate boundary—Accurately located. Sawteeth on upper plate		lineweight .375 mm color 100% red 6.25 mm 5.25 mm 1.0 mm 60° 2.0 mm	
22.11	Active convergent plate boundary—Approximately located. Sawteeth on upper plate		5.25 mm 1.0 mm	
22.12	Active convergent plate boundary—Showing accretionary prism. Sawteeth on upper plate		pattern 429-R	
22.13	Ancient convergent plate boundary—Accurately located. Sawteeth on upper plate		lineweight .25 mm 6.25 mm 5.25 mm 1.0 mm 60° 1.75 mm	May also be shown in other colors.
22.14	Ancient convergent plate boundary—Approximately located. Sawteeth on upper plate		5.25 mm 1.0 mm	
22.15	Active transform fault, sense of offset unspecified—Accurately located		color 100% red lineweight .375 mm	May also be shown in black or other colors.
22.16	Active transform fault, sense of offset unspecified—Approximately located		3.5 mm 1.0 mm	
22.17	Active transform fault, right-lateral offset—Accurately located. Arrows show relative motion		arrow lineweight .3 mm 25° 1.75 mm 5.0 mm color 100% red lineweight .375 mm	
22.18	Active transform fault, right-lateral offset—Approximately located. Arrows show relative motion		3.5 mm 1.0 mm	
22.19	Active transform fault, left-lateral offset—Accurately located. Arrows show relative motion		arrow lineweight .3 mm 25° 1.75 mm 5.0 mm color 100% red lineweight .375 mm	
22.20	Active transform fault, left-lateral offset—Approximately located. Arrows show relative motion		3.5 mm 1.0 mm	
22.21	Active transform fault, normal offset—Accurately located. Hachures on downthrown side		color 100% red lineweight .375 mm 1.0 mm hachure lineweight .175 mm; spacing .375 mm	
22.22	Active transform fault, normal offset—Approximately located. Hachures on downthrown side		3.5 mm 1.0 mm	
22.23	Ancient transform fault, sense of offset unspecified—Accurately located		lineweight .275 mm	May also be shown in black or other colors.
22.24	Ancient transform fault, sense of offset unspecified—Approximately located		3.5 mm 1.0 mm	

*For more information, see general guidelines on pages A-i to A-v.

22—PLATE-TECTONIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
22.25	Continental slope—Accurately located. Rectangles point downslope		lineweight 25 mm tooth height .875 mm; width 1.5 mm 	May also be shown in other colors.
22.26	Continental slope—Approximately located. Rectangles point downslope			
22.27	Continental slope—Showing margin filled by sedimentation. Rectangles point downslope		pattern 119-K 	
22.28	Outline of basin—Accurately located. Sawteeth point into basin		all lineweights .2 mm 	
22.29	Outline of basin—Approximately located. Sawteeth point into basin			
22.30	Deep-sea trench—Patterned where filled by sedimentation		all lineweights .2 mm 	
22.31	Margin of oceanic rise—Accurately located. Hachures point downslope		all lineweights .2 mm 	
22.32	Margin of oceanic rise—Approximately located. Hachures point downslope			
22.33	Volcanic ridge or edifice—Accurately located. Hachures point downslope		all lineweights .2 mm 	
22.34	Volcanic ridge or edifice—Approximately located. Hachures point downslope			
22.35	Guyot—Hachures point downslope		all lineweights .2 mm 	
22.36	Seamount, nonvolcanic origin—Sawteeth point downslope		sawtooth spacing 5.0 mm 	
22.37	Seamount, volcanic origin—Sawteeth point downslope			
22.38	Seamount, nonvolcanic origin (shown as point symbol when too small to outline at map scale)		all lineweights .2 mm 	
22.39	Seamount, volcanic origin (shown as point symbol when too small to outline at map scale)		lineweights .2 mm 	









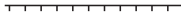
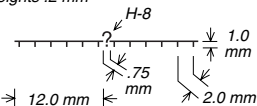
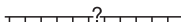
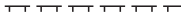
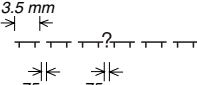
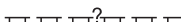

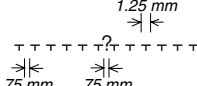
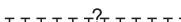
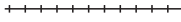
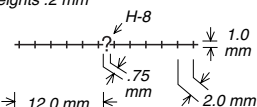
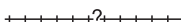
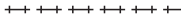
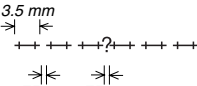
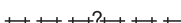
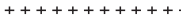
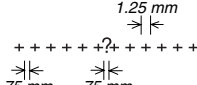
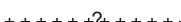








*For more information, see general guidelines on pages A-i to A-v.

23—MISCELLANEOUS UPLIFT AND COLLAPSE FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
23.1	Outline of metamorphic core complex—Identity and existence certain, location accurate. Hachures on upper plate			
23.2	Outline of metamorphic core complex—Identity or existence questionable, location accurate. Hachures on upper plate			
23.3	Outline of metamorphic core complex—Identity and existence certain, location approximate. Hachures on upper plate			
23.4	Outline of metamorphic core complex—Identity or existence questionable, location approximate. Hachures on upper plate			
23.5	Outline of metamorphic core complex—Identity and existence certain, location inferred. Hachures on upper plate			
23.6	Outline of metamorphic core complex—Identity or existence questionable, location inferred. Hachures on upper plate			
23.7	Outline of metamorphic core complex—Identity and existence certain, location concealed. Hachures on upper plate			
23.8	Outline of metamorphic core complex—Identity or existence questionable, location concealed. Hachures on upper plate			
23.9	Collapse structure or sinkhole (too small to draw to scale)			
23.10	Collapse structure or sinkhole (drawn to scale)			
23.11	Crater outline, unspecified origin			
23.12	Uplift—Local, intensely disturbed			
23.13	Salt dome			
23.14	Possible salt dome			
23.15	Salt and (or) shale diapirs			

*For more information, see general guidelines on pages A-i to A-v.

24—TERRESTRIAL IMPACT FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
24.1	Primary terrestrial impact crater (too small to draw to scale) (1st option)		dot diameter 2.125 mm 	
24.2	Secondary terrestrial impact crater (too small to draw to scale) (1st option)—Formed by debris thrown from primary crater		lineweight .2 mm circle diameter 2.125 mm 	
24.3	Primary terrestrial impact crater (too small to draw to scale) (2nd option)		dot diameter 1.625 mm 	
24.4	Secondary terrestrial impact crater (too small to draw to scale) (2nd option)—Formed by debris thrown from primary crater		lineweight .2 mm circle diameter 1.625 mm 	
24.5	Terrestrial impact crater without raised rim—Identity and existence certain, location accurate. Hachures point into crater		all lineweights .2 mm 	
24.6	Terrestrial impact crater without raised rim—Identity or existence questionable, location accurate. Hachures point into crater			
24.7	Terrestrial impact crater without raised rim—Identity or existence certain, location approximate. Hachures point into crater		3.5 mm 	
24.8	Terrestrial impact crater without raised rim—Identity or existence questionable, location approximate. Hachures point into crater			
24.9	Terrestrial impact crater without raised rim—Identity and existence certain, location concealed. Hachures point into crater		1.25 mm 	
24.10	Terrestrial impact crater without raised rim—Identity or existence questionable, location concealed. Hachures point into crater			
24.11	Terrestrial impact crater with raised rim—Identity and existence certain, location accurate		all lineweights .2 mm 	
24.12	Terrestrial impact crater with raised rim—Identity or existence questionable, location accurate			
24.13	Terrestrial impact crater with raised rim—Identity or existence certain, location approximate		3.5 mm 	
24.14	Terrestrial impact crater with raised rim—Identity or existence questionable, location approximate			
24.15	Terrestrial impact crater with raised rim—Identity or existence certain, location concealed		1.25 mm 	
24.16	Terrestrial impact crater with raised rim—Identity or existence questionable, location concealed			
24.17	Outer boundary of floor of terrestrial impact crater		dash length 2.0 mm; spacing .5 mm lineweight .25 mm 	
24.18	Outer boundary of central mound of complex terrestrial impact crater		dash length .75 mm; spacing .375 mm lineweight .2 mm 	
24.19	Terrestrial palimpsest area		100% black pattern 119-K 	
24.20	Palimpsest area around complex terrestrial impact crater—Ejecta obscures morphology of area surrounding crater			

*For more information, see general guidelines on pages A-i to A-v.

25—PLANETARY GEOLOGY FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
25.1	Contact, planetary—Location accurate		lineweight .15 mm	
25.2	Contact, planetary—Location approximate		3.5 mm tick length .75 mm	
25.3	Contact, planetary—Location inferred		1.5 mm tick length .75 mm	
25.4	Contact, planetary—Location concealed		.5 mm tick length .75 mm	
25.5	Fault, planetary, sense of offset unspecified—Location accurate		lineweight .375 mm	
25.6	Fault, planetary, sense of offset unspecified—Location approximate		3.5 mm tick length .75 mm	
25.7	Fault, planetary, sense of offset unspecified—Location inferred		1.5 mm tick length .75 mm	
25.8	Fault, planetary, sense of offset unspecified—Location concealed		.5 mm tick length .75 mm	
25.9	Normal fault, planetary—Location accurate. Ball and bar on downthrown block		lineweight .375 mm ball .875 mm diameter tick length 1.0 mm; lineweight .175 mm	
25.10	Normal fault, planetary—Location approximate. Ball and bar on downthrown block		3.5 mm tick length .75 mm	
25.11	Normal fault, planetary—Location inferred. Ball and bar on downthrown block		1.5 mm tick length .75 mm	
25.12	Normal fault, planetary—Location concealed. Ball and bar on downthrown block		.5 mm tick length .75 mm	
25.13	Strike-slip fault, planetary, right-lateral offset—Location accurate. Arrows show relative motion		lineweight .375 mm 25° 1.75 mm 5.0 mm arrow lineweight .2 mm	
25.14	Strike-slip fault, planetary, right-lateral offset—Location approximate. Arrows show relative motion		3.5 mm tick length .75 mm	
25.15	Strike-slip fault, planetary, right-lateral offset—Location inferred. Arrows show relative motion		1.5 mm tick length .75 mm	
25.16	Strike-slip fault, planetary, right-lateral offset—Location concealed. Arrows show relative motion		.5 mm tick length .75 mm	
25.17	Strike-slip fault, planetary, left-lateral offset—Location accurate. Arrows show relative motion		lineweight .375 mm 25° 1.75 mm 5.0 mm arrow lineweight .2 mm	
25.18	Strike-slip fault, planetary, left-lateral offset—Location approximate. Arrows show relative motion		3.5 mm tick length .75 mm	
25.19	Strike-slip fault, planetary, left-lateral offset—Location inferred. Arrows show relative motion		1.5 mm tick length .75 mm	
25.20	Strike-slip fault, planetary, left-lateral offset—Location concealed. Arrows show relative motion		.5 mm tick length .75 mm	
25.21	Thrust fault, planetary—Location accurate. Sawteeth on upper plate		sawtooth height 1.5 mm lineweight .375 mm 60°	
25.22	Thrust fault, planetary—Location approximate. Sawteeth on upper plate		3.5 mm tick length .75 mm	
25.23	Thrust fault, planetary—Location inferred. Sawteeth on upper plate		1.5 mm tick length .75 mm	
25.24	Thrust fault, planetary—Location concealed. Sawteeth on upper plate		.5 mm tick length .75 mm	

*For more information, see general guidelines on pages A-i to A-v.

25—PLANETARY GEOLOGY FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
25.25	Graben trace, planetary (shown as single line where bounding normal faults cannot be mapped separately)—Location accurate		lineweight .375 mm dot diameter 1.375 mm	
25.26	Graben trace, planetary (shown as single line where bounding normal faults cannot be mapped separately)—Location approximate		3.5 mm 1.5 mm .75 mm	
25.27	Graben trace, planetary (shown as single line where bounding normal faults cannot be mapped separately)—Location inferred		1.5 mm .75 mm	
25.28	Graben trace, planetary (shown as single line where bounding normal faults cannot be mapped separately)—Location concealed		.5 mm .75 mm	
25.29	Regional fracture, planetary		lineweight .3 mm color 100% cyan	
25.30	Partly buried regional fracture, planetary		1.5 mm .75 mm	
25.31	Arcuate fracture, planetary		lineweight .2 mm color 100% purple	
25.32	Partly buried arcuate fracture, planetary		1.5 mm .75 mm	
25.33	Radial fracture, planetary (associated with coronae)		lineweight .325 mm color 100% purple	
25.34	Concentric fracture, planetary (associated with coronae)		lineweight .25 mm color 100% violet	
25.35	Fold crest, planetary		lineweight .3 mm color 100% red	
25.36	Broad warp, planetary		lineweight .635 mm color 100% red .75 mm	
25.37	Wrinkle ridge, planetary		lineweight .25 mm color 100% magenta	
25.38	Ribbon trends, planetary		lineweight .25 mm color 100% green	
25.39	Ridge belt, planetary		all lineweights .25 mm color 100% red 1.75 mm	
25.40	Broad ridge crest, planetary (generally associated with coronae)		lineweight .635 mm color 100% red	
25.41	Ridge crest, planetary (1st option)		65° 3.0 mm lineweight .25 mm 65°	
25.42	Ridge crest, planetary (2nd option)		all lineweights .25 mm	
25.43	Ridge crest, planetary (1st option)—Arrowhead shows abrupt termination of ridge		65° 1.375 mm	
25.44	Ridge crest, planetary (2nd option)—Arrowhead shows abrupt termination of ridge			
25.45	Ridge crest (possible dike), planetary		70° all lineweights .25 mm 3.5 mm	
25.46	Corona annulus ridge, planetary—Showing axial trace and plunge. Short arrow indicates steeper limb or scarp bounding corona trough		3.75 mm all lineweights .25 mm 75° 2.0 mm	

*For more information, see general guidelines on pages A-i to A-v.

25—PLANETARY GEOLOGY FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
25.47	Groove (generic), planetary		lineweight .25 mm	
25.48	Sharp groove, planetary		all lineweights .25 mm ↓ 1.5 mm ↑ .825 mm	
25.49	Subdued groove, planetary		all lineweights .25 mm ↓ 1.5 mm ↑	
25.50	Radially grooved ejecta (schematic), planetary		.75 mm .75 mm .25 mm ↓ ↓ ↓ ↓ ↓ ↓ ↑ ↑ ↑ .75 mm .75 mm .75 mm	
25.51	Furrow, planetary		lineweight .25 mm ↓ 1.75 mm ↑ 1.75 mm	
25.52	Trough or narrow depression, planetary		lineweight .25 mm 65° ↓ 3.0 mm ↑ 65°	
25.53	Depression (mapped to scale), planetary		all lineweights .25 mm hachure height .875 mm; spacing 3.5 mm	
25.54	Large depression (mapped to scale), planetary		all lineweights .25 mm hachure height .625 mm; spacing 3.5 mm pattern 118-K	
25.55	Shallow, linear depression or valley, or narrow channel, planetary		lineweight .25 mm color 100% cyan	
25.56	Channel (canali), planetary		lineweight .25 mm long dash 2.5 mm; short dash .5 mm; spacing .5 mm	
25.57	Channel (canali), planetary—Two short dashes where structureless or indefinite		lineweight .25 mm long dash 2.5 mm; short dashes .5 mm; spacing .5 mm	
25.58	Narrow channel (possible lava channel), planetary—Arrows point in direction of flow		all lineweights .175 mm 4.0 mm ↓ 1.875 mm 45°	
25.59	Erosional boundary, planetary—Erosion increases in direction of arrows		2.5 mm 30° ↓ lineweight .175 mm 20° ↓ 1.5 mm	
25.60	Angular unconformity, planetary—Hachures indicate truncated beds		lineweight .3 mm hachure height 1.75 mm; spacing 2.5 mm lineweight .2 mm	
25.61	Angular unconformity, planetary—Uncertain. Hachures indicate truncated beds		2.25 mm ↓ 5 mm lineweight .2 mm	
25.62	Layer, planetary		1.125 mm ↓ 75 mm lineweight .2 mm	
25.63	Lineament, planetary		lineweight .3 mm 1.5 mm ↓ 5 mm	
25.64	Layering in canyon wall, planetary		all lineweights .2 mm lengths and spacing will vary	
25.65	Fabric of short radar-bright lineaments (schematic), planetary		all lineweights .25 mm lengths and spacing will vary	
25.66	Penetrative lineations, within tessera terrain, planetary		all lineweights .125 mm lengths and spacing will vary	
25.67	Flow direction, planetary		lineweight .175 mm length may vary 3.0 mm 30° ↓ 1.5 mm ↑	
25.68	Wind streaks, planetary—Arrow points in inferred wind direction		all lineweights .2 mm length may vary 3.5 mm 30° ↓ 1.875 mm ↑	
25.69	Area of channelized erosion and scouring, planetary—Arrow points in direction of interpreted flow		lineweight .375 mm 2.75 mm 6.0 mm 30°	
25.70	Area of eolian transport, planetary—Arrow points in direction of air flow		all lineweights .375 mm	

*For more information, see general guidelines on pages A-i to A-v.

25—PLANETARY GEOLOGY FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
25.71	Scarp, planetary—Hachures point downscarp		all lineweights .25 mm 	
25.72	Lobate scarp, planetary—Hachures point downscarp		all lineweights .25 mm 	
25.73	Basal scarp, planetary—Hachures point downscarp		all lineweights .25 mm 	
25.74	Base of scarp, planetary—Barb points downscarp		lineweight .25 mm 	
25.75	Dome, edifice, or circular scarp, planetary (mapped to scale)—Hachures point downscarp		all lineweights .25 mm 	
25.76	Very small shield, dome, or volcanic construct, planetary (not mapped to scale)		all lineweights .4 mm 	
25.77	Small shield, dome, or volcanic construct, planetary (not mapped to scale)		all lineweights .6 mm 	
25.78	Large, steep-sided shield, dome, or volcanic construct, planetary (not mapped to scale)		all lineweights .375 mm circle diameter 4.0 mm 	
25.79	Mesa, planetary (not mapped to scale)		all lineweights .375 mm circle diameter 4.0 mm all barb lengths 1.625 mm 	
25.80	Large shield, dome, or volcanic construct, planetary (mapped to scale)—Hachures point downscarp		all lineweights .3 mm 	
25.81	Large cone, planetary (mapped to scale)—Hachures point downscarp		all lineweights .25 mm 	
25.82	Knob or central peak, planetary (not mapped to scale)		all lineweights .25 mm circle diameter 2.0 mm 	
25.83	Knob, planetary (mapped to scale)—Bar and ball indicate apical fissure. Hachures point downscarp		dot diameter 1.25 mm all lineweights .25 mm 	
25.84	Elevated plateau, planetary (mapped to scale)—Hachures point downscarp		all lineweights .25 mm 	
25.85	Steep-sided edifice, planetary (not mapped to scale)		2.0 mm all lineweights .25 mm 	
25.86	Steep-sided edifice, planetary (not mapped to scale)—Dotted where concealed or buried		short dashes .5 mm; spacing .5 mm 	
25.87	Large edifice, planetary (not mapped to scale)		all lineweights .25 mm 	
25.88	Very small tholi, planetary (not mapped to scale)		lineweight .25 mm 	
25.89	Small tholi, planetary (not mapped to scale)		all lineweights .25 mm circle diameter 3.0 mm 	
25.90	Small tholi, planetary (mapped to scale)		all lineweights .25 mm 	
25.91	Corona, planetary		lineweight .25 mm dash length 1.5 mm; spacing .75 mm 	
25.92	Nova, planetary		lineweight .5 mm dash length 2.25 mm; spacing .75 mm 	
25.93	Palimpsest ring, planetary		dot diameter .875 mm; spacing .375 mm 	









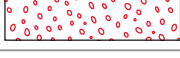
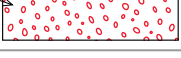




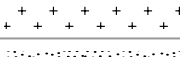
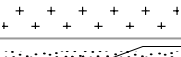











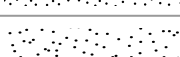
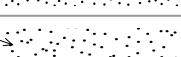
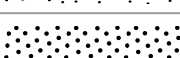
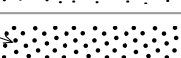





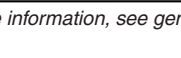
*For more information, see general guidelines on pages A-i to A-v.

25—PLANETARY GEOLOGY FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
25.94	Raised rim of larger impact crater, planetary— Hachures point into crater		all lineweights .3 mm hachure height .75 mm; spacing of hachure pairs .5 mm	
25.95	Raised rim of smaller impact crater, planetary		lineweight .3 mm	
25.96	Raised rim of impact crater, planetary—Showing visible ejecta blanket		lineweight .15 mm	
25.97	Degraded impact crater rim, planetary (1st option)		lineweight .3 mm dash length 1.0 mm; spacing .5 mm	
25.98	Rimless impact crater, subdued impact crater rim, degraded impact crater rim (2nd option), or buried impact crater rim, planetary		lineweight .3 mm long dash 4.0 mm; short dashes .2 mm; spacing .5 mm	
25.99	Secondary impact crater chain and cluster, planetary		lineweight .25 mm dash length 1.5 mm; spacing .5 mm	
25.100	Basin ring, planetary		lineweight .375 mm dash length .75 mm; spacing .75 mm	
25.101	Central peak of impact crater, planetary (1st option)		ellipse width 1.875 mm; height 2.625 mm all lineweights .2 mm	
25.102	Central peak of impact crater, planetary (2nd option)		2.375 mm all lineweights .2 mm	
25.103	Pit of impact crater floor, planetary (1st option)		lineweight .2 mm	
25.104	Pit of impact crater floor, planetary (2nd option)		dot diameter .875 mm	
25.105	Pit-crater chain (mapped to scale), planetary		lineweight .2 mm	
25.106	Small endogenic crater, planetary		dot diameter 1.0 mm	
25.107	Small endogenic crater (mapped to scale), planetary		lineweight .25 mm	
25.108	Medium-sized endogenic crater (mapped to scale), planetary		lineweight .25 mm dot diameter 1.0 mm	
25.109	Large endogenic crater (mapped to scale), planetary		all lineweights .25 mm hachure height 1.25 mm; spacing 3.175 mm	
25.110	Chain craters or collapsed lava tube (mapped to scale), planetary		lineweight .2 mm	
25.111	Caldera, planetary		all lineweights .25 mm hachure height .625 mm; spacing .875 mm	
25.112	Volcano, planetary, having summit crater		lineweight .15 mm	
25.113	Volcano, planetary, without summit crater—Queried if origin is conjectural		H-8	
25.114	Flow front, planetary—Arrow indicates flow direction		1.375 mm lineweight .25 mm arrow lineweight .25 mm 40°	
25.115	Mountain (rugged), planetary—Origin uncertain		lineweight .2 mm line color 50% black	
25.116	Channel bars, planetary—May be erosional or depositional		lineweight .2 mm line color 30% black	
25.117	Slide or slump material, planetary—Arrow indicates direction of movement		lineweight .25 mm 2.5 mm 1.75 mm 60° arrow lineweight .2 mm	

*For more information, see general guidelines on pages A-i to A-v.

25—PLANETARY GEOLOGY FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
25.118	Dark-colored ejecta, planetary		<i>pattern 428-K</i> 	May also be shown in red or other colors.
25.119	Light-colored ejecta, planetary		<i>pattern 429-K</i> 	
25.120	Terrace deposits, planetary		<i>pattern 427-K</i> 	
25.121	Dark-colored mantling material, planetary		<i>pattern 214-K (at 45°)</i> 	
25.122	Secondary crater field, planetary		<i>pattern 102-R</i> 	May also be shown in black or other colors.
25.123	Diffuse highland-lowland boundary scarp, planetary		<i>pattern 134-R</i> 	
25.124	Joint or fracture pattern, planetary		<i>pattern 430-K</i> 	May also be shown in red or other colors.
25.125	Area of reticulate grooves, planetary—Showing trend		<i>pattern 327-K</i> 	
25.126	Detached lobe, planetary—Arrow points in direction of interpreted landslide or debris flow		<i>pattern 116-K</i>  1.75 mm 	
25.127	Low albedo smooth material, planetary—Interpreted as eolian material		<i>pattern 136-K</i> 	
25.128	Airburst spot		<i>pattern 434-K</i> 	
25.129	Mantling material, planetary—Light-colored		<i>pattern 435-K in 50% black</i> 	
25.130	Splotch, planetary—Circular, radar-bright halo on surface		<i>pattern 116-K</i> 	
25.131	Reticulate pattern on plains, planetary		<i>pattern 119-K</i> 	
25.132	Fracture zone, planetary		<i>pattern 137-K</i> 	
25.133	Superficial crater material having weak radar back-scatter coefficient, planetary		<i>pattern 436-K</i> 	
25.134	Crater-associated ejecta halo, planetary		<i>pattern 429-K</i> 	
25.135	Halo without associated crater, planetary		<i>pattern 429-C</i> 	

*For more information, see general guidelines on pages A-i to A-v.

26—GEOHYDROLOGIC FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
26.1—Water wells				
26.1.1	Water well, type unspecified	○	lineweight .15 mm ○ diameter 1.75 mm	May also be shown in cyan or other colors.
26.1.2	Unused water well	⌀	bar lineweight .3 mm ⌀ 3.725 mm circle lineweight .2 mm	
26.1.3	Capped water well	⊖	1.235 mm ⊖ 1.125 mm all lineweights .2 mm	
26.1.4	Shut-in water well	⊖	1.125 mm ⊖ 1.235 mm all lineweights .2 mm	
26.1.5	Dry hole used for water exploration	⊖	1.0 mm ⊖ 1.0 mm all lineweights .2 mm	
26.1.6	Well used for collection of water data	⊖	1.0 mm ⊖ all lineweights .2 mm	
26.1.7	Well used for domestic-water supply	●	● diameter 1.75 mm	
26.1.8	Flowing artesian well, used for domestic-water supply	↑	2.0 mm ↑ 1.25 mm arrow lineweight .15 mm	
26.1.9	Nonflowing artesian well, used for domestic-water supply	⊖	1.375 mm ⊖ radius .3125 mm lineweight .175 mm	
26.1.10	Recharge or waste-injection well, once used for domestic-water supply	↓	2.0 mm ↓ 1.25 mm arrow lineweight .15 mm	
26.1.11	Observation well used for domestic-water supply	⊖	bar lineweight .3 mm ⊖ 3.725 mm 45°	
26.1.12	Observation well used for domestic-water supply— Equipped with a recorder	⊖ ^R	⊖ ^R ← H-6	
26.1.13	Dry well, once used for domestic-water supply	⊖	bar lineweight .2 mm ⊖ 3.725 mm 45°	
26.1.14	Destroyed well, once used for domestic-water supply	⊖	bar lineweights .2 mm ⊖ 3.725 mm 90°	
26.1.15	Test hole for well used for domestic-water supply	⊖	.6 mm ⊖ 2.75 mm bar lineweights .15 mm	
26.1.16	Well used for stock-water supply	○	lineweight .25 mm ○ diameter 1.75 mm	
26.1.17	Flowing artesian well, used for stock-water supply	↑	2.0 mm ↑ 1.25 mm arrow lineweight .15 mm	
26.1.18	Nonflowing artesian well, used for stock-water supply	⊖	1.375 mm ⊖ radius .3125 mm lineweight .175 mm	
26.1.19	Recharge or waste-injection well, once used for stock-water supply	↓	2.0 mm ↓ 1.25 mm arrow lineweight .15 mm	
26.1.20	Observation well used for stock-water supply	⊖	bar lineweight .3 mm ⊖ 3.725 mm 45°	
26.1.21	Observation well used for stock-water supply— Equipped with a recorder	⊖ ^R	⊖ ^R ← H-6	
26.1.22	Dry well, once used for stock-water supply	⊖	bar lineweight .2 mm ⊖ 3.725 mm 45°	
26.1.23	Destroyed well, once used for stock-water supply	⊖	bar lineweights .2 mm ⊖ 3.725 mm 90°	
26.1.24	Test hole for well used for stock-water supply	⊖	.6 mm ⊖ 2.75 mm bar lineweights .15 mm	

26—GEOHYDROLOGIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
26.1—Water wells (continued)				
26.1.25	Well used for irrigation-water supply		outer circle diameter 2.0 mm; lineweight .2 mm inner circle diameter 1.125 mm; lineweight .15 mm	May also be shown in cyan or other colors.
26.1.26	Flowing artesian well used for irrigation-water supply		2.0 mm 1.25 mm arrow lineweight .15 mm	
26.1.27	Nonflowing artesian well used for irrigation-water supply		1.375 mm radius .3125 mm lineweight .175 mm	
26.1.28	Recharge or waste-injection well, once used for irrigation-water supply		2.0 mm 1.25 mm arrow lineweight .15 mm	
26.1.29	Observation well used for irrigation-water supply		bar lineweight .3 mm 3.725 mm 45°	
26.1.30	Observation well used for irrigation-water supply—Equipped with a recorder		R ← H-6	
26.1.31	Dry well, once used for irrigation-water supply		bar lineweight .2 mm 45° 3.725 mm	
26.1.32	Destroyed well, once used for irrigation-water supply		bar lineweights .2 mm 90° 3.725 mm	
26.1.33	Test hole for well used for irrigation-water supply		.6 mm 2.75 mm bar lineweights .15 mm	
26.1.34	Well used for industrial-water supply		outer circle diameter 2.0 mm; lineweight .2 mm inner dot diameter 1.125 mm	
26.1.35	Flowing artesian well used for industrial-water supply		2.0 mm 1.25 mm arrow lineweight .15 mm	
26.1.36	Nonflowing artesian well used for industrial-water supply		1.375 mm radius .3125 mm lineweight .175 mm	
26.1.37	Recharge or waste-injection well, once used for industrial-water supply		2.0 mm 1.25 mm arrow lineweight .15 mm	
26.1.38	Observation well used for industrial-water supply		bar lineweight .3 mm 3.725 mm 45°	
26.1.39	Observation well used for industrial-water supply—Equipped with a recorder		R ← H-6	
26.1.40	Dry well, once used for industrial-water supply		bar lineweight .2 mm 45° 3.725 mm	
26.1.41	Destroyed well, once used for industrial-water supply		bar lineweights .2 mm 90° 3.725 mm	
26.1.42	Test hole for well used for industrial-water supply		.6 mm 2.75 mm bar lineweights .15 mm	

*For more information, see general guidelines on pages A-i to A-v.

26—GEOHYDROLOGIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
26.1—Water wells (continued)				
26.1.43	Well used for public-water supply		lineweight .375 mm diameter 2.0 mm	May also be shown in cyan or other colors.
26.1.44	Flowing artesian well used for public-water supply		2.0 mm 1.25 mm arrow lineweight .15 mm	
26.1.45	Nonflowing artesian well used for public-water supply		1.375 mm radius .3125 mm lineweight .175 mm	
26.1.46	Recharge or waste-injection well, once used for public-water supply		2.0 mm 1.25 mm arrow lineweight .15 mm	
26.1.47	Observation well used for public-water supply		bar lineweight .3 mm 3.725 mm 45°	
26.1.48	Observation well used for public-water supply— Equipped with a recorder		R H-6	
26.1.49	Dry well, once used for public-water supply		bar lineweight .2 mm 45° 3.725 mm	
26.1.50	Destroyed well, once used for public-water supply		bar lineweights .2 mm 90° 3.725 mm	
26.1.51	Test hole for well used for public-water supply		.6 mm 2.75 mm bar lineweights .15 mm	


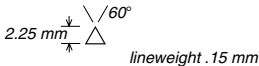





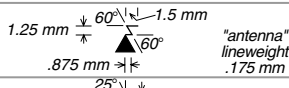

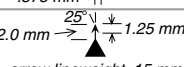





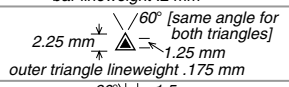

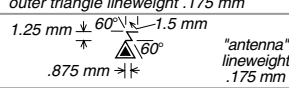



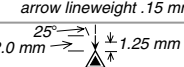

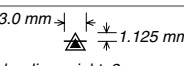

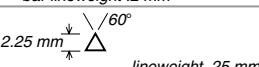

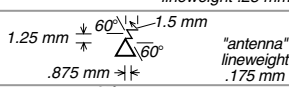





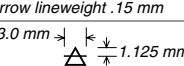
*For more information, see general guidelines on pages A-i to A-v.

26—GEOHYDROLOGIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
26.2—Springs				
26.2.1	Spring, type of use unspecified		all lineweights .15 mm draft "tail" as shown circle diameter 1.75 mm	Rotate "tail" to point in direction of flow. May also be shown in cyan, red, or other colors.
26.2.2	Unused spring		bar lineweight .3 mm circle and "tail" lineweight .2 mm 3.725 mm	
26.2.3	Spring used for collection of water-quality data		circle and "tail" lineweight .2 mm dot diameter .375 mm	
26.2.4	Spring used for domestic-water supply		"tail" lineweight .2 mm draft "tail" as shown dot diameter 1.75 mm	
26.2.5	Thermal spring used for domestic-water supply		H-6 →	
26.2.6	Mineral spring used for domestic-water supply		H-6 →	
26.2.7	Extinct spring, once used for domestic-water supply		3.725 mm bar lineweight .2 mm	
26.2.8	Spring used for stock-water supply		"tail" lineweight .2 mm draft "tail" as shown circle diameter 1.75 mm; lineweight .2 mm	
26.2.9	Thermal spring used for stock-water supply		H-6 →	
26.2.10	Mineral spring used for stock-water supply		H-6 →	
26.2.11	Extinct spring, once used for stock-water supply		3.725 mm bar lineweight .2 mm	
26.2.12	Spring used for irrigation-water supply		inner circle diameter 1.125 mm; lineweight .15 mm draft "tail" as shown "tail" lineweight .2 mm outer circle diameter 1.75 mm; lineweight .2 mm	
26.2.13	Thermal spring used for irrigation-water supply		H-6 →	
26.2.14	Mineral spring used for irrigation-water supply		H-6 →	
26.2.15	Extinct spring, once used for irrigation-water supply		3.725 mm bar lineweight .2 mm	
26.2.16	Spring used for industrial-water supply		inner dot diameter 1.125 mm draft "tail" as shown "tail" lineweight .2 mm outer circle diameter 1.75 mm; lineweight .2 mm	
26.2.17	Thermal spring used for industrial-water supply		H-6 →	
26.2.18	Mineral spring used for industrial-water supply		H-6 →	
26.2.19	Extinct spring, once used for industrial-water supply		3.725 mm bar lineweight .2 mm	
26.2.20	Spring used for public-water supply		"tail" lineweight .2 mm draft "tail" as shown circle diameter 2.0 mm; lineweight .375 mm	
26.2.21	Thermal spring used for public-water supply		H-6 →	
26.2.22	Mineral spring used for public-water supply		H-6 →	
26.2.23	Extinct spring, once used for public-water supply		3.725 mm bar lineweight .2 mm	


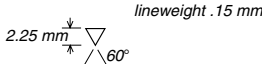

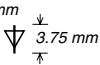



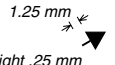

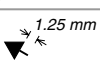



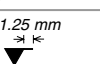

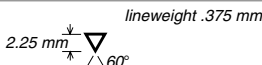

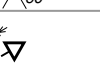

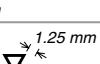

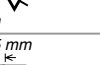

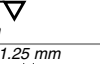
*For more information, see general guidelines on pages A-i to A-v.

26—GEOHYDROLOGIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
26.3—Water gaging stations				
26.3.1	Water gaging station, type of measurement unspecified		 2.25 mm line weight .15 mm	May also be shown in cyan or other colors.
26.3.2	Discontinued water gaging station		 bar line weight .3 mm triangle line weight .2 mm	
26.3.3	Continuous-record water gaging station		 2.25 mm line weight .15 mm	
26.3.4	Continuous-record water gaging station—Equipped with a telephone or radio		 1.25 mm 60° 1.5 mm 60° .875 mm "antenna" line weight .175 mm	
26.3.5	Continuous-record peak-flow measurement water gaging station		 2.0 mm 25° 1.25 mm arrow line weight .15 mm	
26.3.6	Continuous-record low-flow measurement water gaging station		 2.0 mm 25° 1.25 mm arrow line weight .15 mm	
26.3.7	Continuous-record stage-measurement water gaging station		 3.0 mm 1.125 mm bar line weight .2 mm	
26.3.8	Partial-record water gaging station (floods)		 2.25 mm 60° 1.25 mm 60° outer triangle line weight .175 mm	
26.3.9	Partial-record water gaging station (floods)—Equipped with a telephone or radio		 1.25 mm 60° 1.5 mm 60° .875 mm "antenna" line weight .175 mm	
26.3.10	Partial-record peak-flow measurement water gaging station (floods)		 2.0 mm 25° 1.25 mm arrow line weight .15 mm	
26.3.11	Partial-record low-flow measurement water gaging station (floods)		 2.0 mm 25° 1.25 mm arrow line weight .15 mm	
26.3.12	Partial-record stage-measurement water gaging station (floods)		 3.0 mm 1.125 mm bar line weight .2 mm	
26.3.13	Measurement site without a gage		 2.25 mm line weight .25 mm	
26.3.14	Measurement site without a gage—Equipped with a telephone or radio		 1.25 mm 60° 1.5 mm 60° .875 mm "antenna" line weight .175 mm	
26.3.15	Peak-flow measurement site without a gage		 2.0 mm 25° 1.25 mm arrow line weight .15 mm	
26.3.16	Low-flow measurement site without a gage		 2.0 mm 25° 1.25 mm arrow line weight .15 mm	
26.3.17	Stage-measurement site without a gage		 3.0 mm 1.125 mm bar line weight .2 mm	

*For more information, see general guidelines on pages A-i to A-v.

26—GEOHYDROLOGIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
26.4—Quality-of-water sites				
26.4.1	Quality-of-water site, type of measurement unspecified		 lineweight .15 mm	May also be shown in cyan or other colors.
26.4.2	Inactive quality-of-water site		 triangle lineweight .2 mm bar lineweight .3 mm	
26.4.3	Active quality-of-water site		 60°	
26.4.4	Active quality-of-water site, chemical measurement		 bar lineweight .25 mm	
26.4.5	Active quality-of-water site, temperature measurement		 bar lineweight .25 mm	
26.4.6	Active quality-of-water site, biological measurement		 bar lineweight .25 mm	
26.4.7	Active quality-of-water site, sediment measurement		 bar lineweight .25 mm	
26.4.8	Active quality-of-water site—Equipped with a monitor		 lineweight .375 mm	
26.4.9	Active quality-of-water site, chemical measurement—Equipped with a monitor		 bar lineweight .25 mm	
26.4.10	Active quality-of-water site, temperature measurement—Equipped with a monitor		 bar lineweight .25 mm	
26.4.11	Active quality-of-water site, biological measurement—Equipped with a monitor		 bar lineweight .25 mm	
26.4.12	Active quality-of-water site, sediment measurement—Equipped with a monitor		 bar lineweight .25 mm	




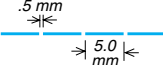



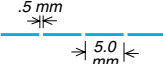



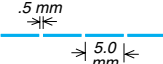



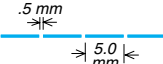



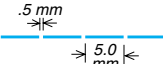



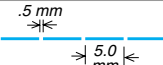



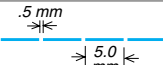



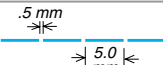



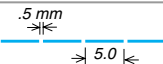
*For more information, see general guidelines on pages A-i to A-v.

26—GEOHYDROLOGIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
26.5—Geohydrologic contours				
26.5.1	Structure contour (index), as shown on hydrologic maps, showing altitude of top or base of, or horizon within, stratigraphic unit, aquifer, or confining bed—Accurately located		lineweight .375 mm 600 line and text color 100% red	On most maps, every fourth or fifth contour is an index contour, and usually only index contours are labeled. May be shown in black or other colors.
26.5.2	Structure contour (index), as shown on hydrologic maps, showing altitude of top or base of, or horizon within, stratigraphic unit, aquifer, or confining bed—Approximately located		.5 mm 5.0 mm	
26.5.3	Structure contour (intermediate), as shown on hydrologic maps, showing altitude of top or base of, or horizon within, stratigraphic unit, aquifer, or confining bed—Accurately located		lineweight .275 mm line color 100% red	
26.5.4	Structure contour (intermediate), as shown on hydrologic maps, showing altitude of top or base of, or horizon within, stratigraphic unit, aquifer, or confining bed—Approximately located		.5 mm 5.0 mm	
26.5.5	Bedrock contour (index), as shown on hydrologic maps, showing altitude of bedrock surface—Accurately located		lineweight .375 mm 600 line and text color 100% violet	On most maps, every fourth or fifth contour is an index contour, and usually only index contours are labeled. May be shown in black or other colors.
26.5.6	Bedrock contour (index), as shown on hydrologic maps, showing altitude of bedrock surface—Approximately located		.5 mm 5.0 mm	
26.5.7	Bedrock contour (intermediate), as shown on hydrologic maps, showing altitude of bedrock surface—Accurately located		lineweight .275 mm line color 100% violet	
26.5.8	Bedrock contour (intermediate), as shown on hydrologic maps, showing altitude of bedrock surface—Approximately located		.5 mm 5.0 mm	
26.5.9	Water-table contour (index), showing altitude of unconfined water table [date]—Accurately located		lineweight .375 mm 600 line and text color 100% cyan	Use only in reference to unconfined (water-table) conditions. On most maps, every fourth or fifth contour is an index contour, and usually only index contours are labeled. May be shown in black or other colors.
26.5.10	Water-table contour (index), showing altitude of unconfined water table [date]—Approximately located		.5 mm 5.0 mm	
26.5.11	Water-table contour (intermediate), showing altitude of unconfined water table [date]—Accurately located		lineweight .275 mm line color 100% cyan	
26.5.12	Water-table contour (intermediate), showing altitude of unconfined water table [date]—Approximately located		.5 mm 5.0 mm	
26.5.13	Potentiometric or water-level contour (index), showing altitude at which water level would have stood in tightly cased wells [date]—Accurately located		lineweight .375 mm 600 line and text color 100% cyan	Use in reference to either confined (artesian) or unconfined conditions, when they are not differentiated on map. On most maps, every fourth or fifth contour is an index contour, and usually only index contours are labeled. May be shown in black or other colors.
26.5.14	Potentiometric or water-level contour (index), showing altitude at which water level would have stood in tightly cased wells [date]—Approximately located		.5 mm 5.0 mm	
26.5.15	Potentiometric or water-level contour (intermediate), showing altitude at which water level would have stood in tightly cased wells [date]—Accurately located		lineweight .275 mm line color 100% cyan	
26.5.16	Potentiometric or water-level contour (intermediate), showing altitude at which water level would have stood in tightly cased wells [date]—Approximately located		.5 mm 5.0 mm	
26.5.17	Water-quality-zone contour (index), showing altitude of top or base of, or horizon within, [type of] water-quality zone or water in aquifer [date]—Accurately located		lineweight .375 mm 600 line and text color 100% green	On most maps, every fourth or fifth contour is an index contour, and usually only index contours are labeled. May be shown in black or other colors.
26.5.18	Water-quality-zone contour (index), showing altitude of top or base of, or horizon within, [type of] water-quality zone or water in aquifer [date]—Approximately located		.5 mm 5.0 mm	
26.5.19	Water-quality-zone contour (intermediate), showing altitude of top or base of, or horizon within, [type of] water-quality zone or water in aquifer [date]—Accurately located		lineweight .275 mm line color 100% green	
26.5.20	Water-quality-zone contour (intermediate), showing altitude of top or base of, or horizon within, [type of] water-quality zone or water in aquifer [date]—Approximately located		.5 mm 5.0 mm	

*For more information, see general guidelines on pages A-i to A-v.

26—GEOHYDROLOGIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
26.6—Geohydrologic lines				
26.6.1	Line of equal, average, mean, or median (etc.) annual, monthly, or daily (etc.) precipitation [date]—Accurately located		lineweight .375 mm  line and text color 100% cyan	Negative values must be preceded by a minus (–) sign. Date needed only for parameters that vary with time. May be shown in black or other colors.
26.6.2	Line of equal, average, mean, or median (etc.) annual, monthly, or daily (etc.) precipitation [date]—Approximately located			
26.6.3	Line of equal depth to geologic formation, bedrock, aquifer, or water (etc.) [date]—Accurately located		lineweight .375 mm  line and text color 100% cyan	
26.6.4	Line of equal depth to geologic formation, bedrock, aquifer, or water (etc.) [date]—Approximately located			
26.6.5	Line of equal thickness of geologic formation, aquifer, confining bed, or saturated material (etc.) [date]—Accurately located		lineweight .375 mm  line and text color 100% cyan	
26.6.6	Line of equal thickness of geologic formation, aquifer, confining bed, or saturated material (etc.) [date]—Approximately located			
26.6.7	Line of equal water temperature [date]—Accurately located		lineweight .375 mm  line and text color 100% cyan	
26.6.8	Line of equal water temperature [date]—Approximately located			
26.6.9	Line of equal specific conductance [date]—Accurately located		lineweight .375 mm  line and text color 100% cyan	
26.6.10	Line of equal specific conductance [date]—Approximately located			
26.6.11	Line of equal dissolved-solids concentration, hardness, or chemical-constituent concentration [date]—Accurately located		lineweight .375 mm  line and text color 100% cyan	
26.6.12	Line of equal dissolved-solids concentration, hardness, or chemical-constituent concentration [date]—Approximately located			
26.6.13	Line of equal water-level change, rise, or decline [date]—Accurately located		lineweight .375 mm  line and text color 100% cyan	
26.6.14	Line of equal water-level change, rise, or decline [date]—Approximately located			
26.6.15	Line of equal runoff [date]—Accurately located		lineweight .375 mm  line and text color 100% cyan	
26.6.16	Line of equal runoff [date]—Approximately located			
26.6.17	Line of equal transmissivity, hydraulic conductivity, or porosity (etc.)—Accurately located		lineweight .375 mm  line and text color 100% cyan	
26.6.18	Line of equal transmissivity, hydraulic conductivity, or porosity (etc.)—Approximately located			











































*For more information, see general guidelines on pages A-i to A-v.

26—GEOHYDROLOGIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
26.7—Miscellaneous geohydrologic features				
26.7.1	Watershed basin boundary, drainage divide, or surface-water basin boundary		lineweight .6 mm dash length 7.5 mm dot diameter .625 mm; spacing .5 mm	May also be shown in cyan or other colors.
26.7.2	Watershed subbasin boundary, drainage subdivide, or surface-water subbasin boundary		lineweight .425 mm dash length 5.0 mm dot diameter .45 mm; spacing .5 mm	
26.7.3	Ground-water divide—Accurately located		dot diameter .675 mm; spacing .575 mm	
26.7.4	Ground-water divide—Approximately located		lineweight .15 mm circle diameter .675 mm; spacing .575 mm	
26.7.5	Ground-water barrier (geologic)—Accurately located		lineweight .175 mm dot diameter .675 mm; spacing .575 mm	
26.7.6	Ground-water barrier (geologic)—Approximately located		lineweight .175 mm circle lineweight .15 mm; diameter .675 mm; spacing .575 mm	
26.7.7	Infiltration gallery		all lineweights .15 mm square side 1.75 mm spacing 1.125 mm	
26.7.8	Direction of ground-water flow (1st option)—Accurately located		1.125 mm 5.75 mm 30° 2.125 mm	
26.7.9	Direction of ground-water flow (2nd option)—Accurately located		lineweight .15 mm	
26.7.10	Direction of ground-water flow (1st option)—Approximately located		6.75 mm all lineweights .25 mm 2.75 mm 25° 1.5 mm	
26.7.11	Direction of ground-water flow (2nd option)—Approximately located		dash 1.5 mm; space .5 mm	

*For more information, see general guidelines on pages A-i to A-v.

27—WEATHER STATIONS

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
27.1	Weather station, type of measurement unspecified		2.0 mm  all lineweights .15 mm	
27.2	Discontinued weather station		bar lineweight .3 mm  "foursquare"  lineweight .2 mm	
27.3	Snow-survey course—Equipped with a telephone or radio		1.25 mm  "foursquare"  lineweight .2 mm	60°  1.5 mm "antenna" lineweight .175 mm
27.4	Snow-survey course—Equipped with a recorder			H-6
27.5	Weather station measuring precipitation—Equipped with a telephone or radio			
27.6	Weather station measuring precipitation—Equipped with a recorder			
27.7	Weather station measuring evaporation—Equipped with a telephone or radio			
27.8	Weather station measuring evaporation—Equipped with a recorder			
27.9	Weather station measuring temperature—Equipped with a telephone or radio			
27.10	Weather station measuring temperature—Equipped with a recorder			
27.11	Weather station measuring humidity—Equipped with a telephone or radio			
27.12	Weather station measuring humidity—Equipped with a recorder			
27.13	Weather station measuring solar radiation—Equipped with a telephone or radio		H-6 	
27.14	Weather station measuring solar radiation—Equipped with a recorder			
27.15	Weather station measuring wind velocity—Equipped with a telephone or radio		arrow  lineweight .175 mm	5.0 mm  25°  1.25 mm  1.25 mm
27.16	Weather station measuring wind velocity—Equipped with a recorder			
27.17	Complete weather station—Equipped with a telephone or radio			
27.18	Complete weather station—Equipped with a recorder			




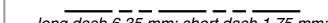









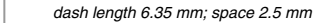

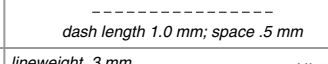
*For more information, see general guidelines on pages A-i to A-v.

28—TRANSPORTATION FEATURES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
28.1	Highway (generic)		 lineweight .325 mm; line color 70% black	May be used on non-topographic maps to show highways and streets.
28.2	Road or street (generic)		 lineweight .25 mm; line color 50% black	
28.3	Primary highway, undivided (Class 1)		outlines: lineweight .125 mm in 100% black .5 mm fill: lineweight .5 mm; line color 100% red	
28.4	Primary highway, divided by centerline (Class 1)		.5 mm .5 mm	
28.5	Primary highway, divided by median strip (Class 1)		.5 mm ← spacing may vary	
28.6	Secondary highway, undivided (Class 2)		fill: dash length 3.0 mm; space 3.0 mm	
28.7	Secondary highway, divided by centerline (Class 2)		.5 mm .5 mm	
28.8	Secondary highway, divided by median strip (Class 2)		.5 mm ← spacing may vary	
28.9	Light-duty road, paved (Class 3)		outlines: lineweight .125 mm in 100% black .5 mm fill: lineweight .5 mm; line color 50% black	
28.10	Light-duty road, gravel (Class 3)		.5 mm fill: dash length 3.0 mm; space 1.5 mm	
28.11	Light-duty road, dirt (Class 3)		.5 mm fill: dash length 1.5 mm; space 3.0 mm	
28.12	Street in urban area; light-duty road, composition unspecified (Class 3)		lineweights .125 mm .5 mm	
28.13	Unimproved road (Class 4)		lineweights .125 mm .5 mm dash length 1.25 mm; space .5 mm	
28.14	Four-wheel-drive road (Class 5)		lineweights .125 mm .5 mm 4WD HI-5 dash length 1.25 mm; space .5 mm	
28.15	Trail		lineweight .15 mm dash length 1.25 mm; space .5 mm	
28.16	Interstate route marker		H-6 (100% red) draft as shown lineweight .2 mm; line color 100% red	
28.17	U.S. route marker		H-6 (100% red) draft as shown lineweight .2 mm; line color 100% red	
28.18	State route marker		H-6 (100% red) circle diameter 4.375 mm lineweight .2 mm; line color 100% red	
28.19	Railroad (single track)		all lineweights .125 mm 5.0 mm 1.0 mm	
28.20	Railroad (more than one track)—Showing number of tracks		all lineweights .125 mm 1.325 mm 5.0 mm .5 mm HI-5 4 TRACKS	

*For more information, see general guidelines on pages A-i to A-v.

29—BOUNDARIES

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
29.1	Boundary—National		<i>lineweight .4 mm</i>  <i>long dash 6.35 mm; short dash 1.75 mm; space .835 mm</i>	
29.2	Boundary—State, territory		<i>lineweight .3 mm</i>  <i>long dash 6.35 mm; short dash 1.75 mm; space .835 mm</i>	
29.3	Boundary—County, parish, Alaska borough, municipio, judicial division		<i>lineweight .25 mm</i>  <i>long dash 6.35 mm; short dash 1.75 mm; space .835 mm</i>	
29.4	Boundary—Civil township, town, district, precinct, barrio		<i>lineweight .175 mm</i>  <i>dash length 4.325 mm; space .835 mm</i>	
29.5	Boundary—Incorporated city, village, town, borough, or hamlet		<i>lineweight .175 mm</i>  <i>long dash 2.0 mm; short dash 1.0 mm; space .5 mm</i>	
29.6	Boundary—National or state park, monument, reservation, forest, grassland, wilderness area, or wildlife refuge; Hawaii Homestead, Forest Reserve		<i>lineweight .175 mm</i> <i>dot diameter .25 mm</i>  <i>dash length 6.35 mm; space 2.5 mm</i>	
29.7	Boundary—Small park		<i>lineweight .125 mm</i>  <i>dash length 1.0 mm; space .5 mm</i>	
29.8	Continental Divide		<i>lineweight .3 mm</i>  <i>dash 10.0 mm; space 2.5 mm</i>	

*For more information, see general guidelines on pages A-i to A-v.

30— TOPOGRAPHIC AND HYDROGRAPHIC FEATURES







REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
30.1— Topographic, bathymetric, and glacier contours				
30.1.1	Index topographic contour (1st option)		lineweight .25 mm line and text color 100% brown HI-6	On most maps, every fourth or fifth contour is an index contour. Usually only index and supplementary contours are labeled. Negative values must be preceded by a minus (–) sign.
30.1.2	Index topographic contour (1st option)— Approximate or indefinite		1.75 mm tick length .5 mm HI-6	
30.1.3	Intermediate topographic contour (1st option)		lineweight .15 mm line color 100% brown	
30.1.4	Intermediate topographic contour (1st option)— Approximate or indefinite		1.75 mm tick length .5 mm	
30.1.5	Supplementary topographic contour (1st option)		lineweight .2 mm line and text color 100% brown HI-6	
30.1.6	Supplementary topographic contour (1st option)— Approximate or indefinite		1.75 mm tick length .5 mm HI-6	
30.1.7	Index topographic depression contour (1st option)		tick lineweight .15 mm; length .5 mm; spacing 3.0 mm contour lineweight .25 mm line color 100% brown	Hachures are added to indicate closed areas of low values.
30.1.8	Intermediate topographic depression contour (1st option)		tick length .5 mm; spacing 3.0 mm all lineweights .15 mm line color 100% brown	
30.1.9	Supplementary topographic depression contour (1st option)		tick lineweight .15 mm; length .5 mm; spacing 3.0 mm contour lineweight .2 mm line color 100% brown	
30.1.10	Topographic depression contours (1st option)— Showing tick spacing of adjacent contours		tick spacing 1.0 mm on lowest contour; on next contour, 2.0 mm; on all others, 3.0 mm (lineweights, etc., are given above)	
30.1.11	Index topographic contour (2nd option)		lineweight .25 mm line and text color 50% black HI-6	On most maps, every fourth or fifth contour is an index contour. Usually only index and supplementary contours are labeled. Negative values must be preceded by a minus (–) sign.
30.1.12	Index topographic contour (2nd option)— Approximate or indefinite		1.75 mm tick length .5 mm HI-6	
30.1.13	Intermediate topographic contour (2nd option)		lineweight .15 mm line color 50% black	
30.1.14	Intermediate topographic contour (2nd option)— Approximate or indefinite		1.75 mm tick length .5 mm	
30.1.15	Supplementary topographic contour (2nd option)		lineweight .2 mm line and text color 50% black HI-6	
30.1.16	Supplementary topographic contour (2nd option)— Approximate or indefinite		1.75 mm tick length .5 mm HI-6	
30.1.17	Index topographic depression contour (2nd option)		tick lineweight .15 mm; length .5 mm; spacing 3.0 mm contour lineweight .25 mm line color 50% black	Hachures are added to indicate closed areas of low values.
30.1.18	Intermediate topographic depression contour (2nd option)		tick length .5 mm; spacing 3.0 mm all lineweights .15 mm line color 50% black	
30.1.19	Supplementary topographic depression contour (2nd option)		tick lineweight .15 mm; length .5 mm; spacing 3.0 mm contour lineweight .2 mm line color 50% black	
30.1.20	Topographic depression contours (2nd option)— Showing tick spacing of adjacent contours		tick spacing 1.0 mm on lowest contour; on next contour, 2.0 mm; on all others, 3.0 mm (lineweights, etc., are given above)	

*For more information, see general guidelines on pages A-i to A-v.

30—TOPOGRAPHIC AND HYDROGRAPHIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
30.1—Topographic, bathymetric, and glacier contours (continued)				
30.1.21	Index primary bathymetric contour		lineweight .275 mm 	On most maps, every fourth or fifth contour is an index contour. Do not break contours for contour values. Bathymetric contour values are always given in "below sea-level" units, so they are not preceded by a minus (-) sign.
30.1.22	Index primary bathymetric contour—Approximate			
30.1.23	Primary bathymetric contour		lineweight .175 mm 	
30.1.24	Primary bathymetric contour—Approximate			
30.1.25	Supplementary bathymetric contour		lineweight .2 mm 	
30.1.26	Supplementary bathymetric contour—Approximate			
30.1.27	Index bathymetric contour		lineweight .25 mm 	
30.1.28	Index bathymetric contour—Approximate			
30.1.29	Intermediate bathymetric contour		lineweight .15 mm 	
30.1.30	Intermediate bathymetric contour—Approximate			
30.1.31	Index primary bathymetric depression contour		tick lineweight .175 mm; length .375 mm (spacing varies) 	Hachures are added to the lowest contour(s) to indicate a closed area of low values (depression) and also an area of higher value (rise) inside a depression.
30.1.32	Index primary bathymetric rise contour (inside depression)			
30.1.33	Primary bathymetric depression contour		tick length .375 mm (spacing varies) 	
30.1.34	Primary bathymetric rise contour (inside depression)			
30.1.35	Supplementary bathymetric depression contour		tick lineweight .175 mm; length .375 mm (spacing varies) 	
30.1.36	Supplementary bathymetric rise contour (inside depression)			
30.1.37	Index bathymetric depression contour		tick lineweight .175 mm; length .375 mm (spacing varies) 	
30.1.38	Index bathymetric rise contour (inside depression)			
30.1.39	Intermediate bathymetric depression contour		tick length .375 mm (spacing varies) 	
30.1.40	Intermediate bathymetric rise contour (inside depression)			
30.1.41	Bathymetric rise contour (inside depression)—Showing hachure spacing for closed contours less than 12.7 mm in circumference		tick spacing 1.0 mm 	
30.1.42	Bathymetric depression contours—Showing hachure spacing for closed contours less than 12.7 mm in circumference		tick spacing 1.0 mm 	
30.1.43	Bathymetric depression or rise contours—Showing hachure spacing for closed contours between 12.7 mm and 76.2 mm in circumference		tick spacing 2.0 mm 	
30.1.44	Bathymetric depression or rise contours—Showing hachure spacing for closed contours more than 76.2 mm in circumference		tick spacing 2.5 mm 	

30—TOPOGRAPHIC AND HYDROGRAPHIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE
30.1 — Topographic, bathymetric, and glacier contours (continued)				
30.1.45	Index contour on glacier or permanent snowfield		lineweight .225 mm line color 100% cyan	On most maps, every fourth or fifth contour is an index contour.
30.1.46	Index contour on glacier or permanent snowfield—Approximate or indefinite		2.5 mm tick length .5 mm line color 100% cyan	
30.1.47	Intermediate contour on glacier or permanent snowfield		lineweight .125 mm line color 100% cyan	
30.1.48	Intermediate contour on glacier or permanent snowfield—Approximate or indefinite		2.5 mm tick length .5 mm line color 100% cyan	
30.1.49	Index depression contour on glacier or permanent snowfield		tick lineweight .15 mm; length .5 mm; spacing 3.0 mm contour lineweight .225 mm line color 100% cyan	Hachures are added to indicate closed areas of low values.
30.1.50	Intermediate depression contour on glacier or permanent snowfield—Approximate or indefinite		tick length .5 mm; spacing 3.0 mm all lineweights .125 mm line color 100% cyan	

*For more information, see general guidelines on pages A-i to A-v.

30—TOPOGRAPHIC AND HYDROGRAPHIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
30.2—Drainage features				
30.2.1	Perennial river, stream, or creek (single-line drainage)		 line weight .2 mm line color 100% cyan TI-8 (100% black)	Letter size and spacing may be increased along longer features.
30.2.2	Intermittent river, stream, creek, or wash (single-line drainage)		 line weight .2 mm long dash length 4.3 mm; very short dash .2 mm; spacing .6 mm color 100% cyan	
30.2.3	Perennial river, stream, or creek (double-line drainage)		 TI-8 (100% black) color fill 20% cyan all line weights .2 mm spacing may vary	Letter size and spacing may be increased along wider features.
30.2.4	River mileage marker		 line weight .2 mm H-6	
30.2.5	Intermittent river, stream, creek, or wash (double-line drainage)		 pattern 132-C	
30.2.6	Braided river, stream, or creek		 all line weights .2 mm color 100% cyan	
30.2.7	Canal or ditch (single-line drainage)		 line weight .2 mm HI-6 (100% cyan)	
30.2.8	Canal or ditch (double-line drainage)		 color fill 20% cyan all line weights .2 mm spacing may vary	
30.2.9	Canal lock (single-line drainage) (1st option)		 1.25 mm Lock H-6 (100% black) line weight .325 mm	
30.2.10	Canal lock (single-line drainage) (2nd option)			
30.2.11	Canal lock (double-line drainage)		 line weight .325 mm width may vary	
30.2.12	Floodgate		 line weight .325 mm H-6 (100% black)	
30.2.13	Tidegate		 line weight .325 mm H-6 (100% black)	
30.2.14	Sluice gate		 line weight .325 mm H-6 (100% black)	
30.2.15	Fish ladder		 line weight .5 mm length may vary H-6 (100% black)	
30.2.16	Aqueduct (single-line drainage)		 line weight .2 mm HI-6 (100% cyan)	
30.2.17	Aqueduct (double-line drainage)		 color fill 20% cyan all line weights .2 mm spacing may vary	
30.2.18	Underground or underwater aqueduct		 dash length 1.25 mm; spacing .5 mm	
30.2.19	Aboveground water pipeline		 HI-6 (100% cyan)	
30.2.20	Underground or submerged water pipeline		 HI-6 (100% cyan) dash length 1.25 mm; spacing .5 mm	
30.2.21	Elevated water pipeline		 wing length .575 mm; angle 45° all line weights .2 mm HI-6 (100% cyan)	
30.2.22	Flume		 HI-6 (100% cyan)	
30.2.23	Siphon		 HI-6 (100% cyan) dash length 1.25 mm; spacing .5 mm	
30.2.24	Penstock		 HI-6 (100% cyan)	

30—TOPOGRAPHIC AND HYDROGRAPHIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
30.2—Drainage features (continued)				
30.2.25	Falls (single-line drainage)		TBI-7 (100% black) → Falls line color 100% cyan all lineweights .2 mm 1.25 mm	
30.2.26	Falls (double-line drainage)		Falls lineweights .125 mm	
30.2.27	Rapids (single-line drainage)		Rapids 6 mm 1.25 mm	
30.2.28	Rapids (double-line drainage)		Rapids lineweights .125 mm	
30.2.29	Shoreline—Showing open water		line color 100% cyan color fill 20% cyan lineweight .2 mm	
30.2.30	Indefinite or unsurveyed shoreline		dash length 1.75 mm; spacing .5 mm	
30.2.31	Approximate mean low water line		lineweight .15 mm	
30.2.32	Perennial lake or pond—Showing name		TI-8 (100% black) → Bass Lake line color 100% cyan color fill 20% cyan lineweight .2 mm	Letter size and spacing may be increased within larger features.
30.2.33	Intermittent lake or pond		lineweight .2 mm; dash length 1.75 mm; spacing .5 mm pattern 132-C line color 100% cyan	
30.2.34	Dry lake or pond		pattern 132-B	
30.2.35	Land subject to inundation		pattern 231-C (@90%)	
30.2.36	Reservoir with natural shoreline		line color 100% cyan color fill 20% cyan	
30.2.37	Dammed reservoir		color fill 20% cyan lineweight .3 mm	
30.2.38	Area to be submerged behind dam		pattern 132-C	
30.2.39	Reservoir (uncovered) with man-made shoreline		lineweight .15 mm color fill 20% cyan	
30.2.40	Covered water storage reservoir		lineweight .15 mm pattern 214-K (@45°) [pattern overprints 20% cyan color fill]	
30.2.41	Salt flat		H-7 → Salt Flat line color 100% cyan lineweight .2 mm	
30.2.42	Carolina bay		dash length 1.75 mm; spacing .5 mm line color 100% cyan lineweight .2 mm	
30.2.43	Tailings pond		H-7 → Tailings Pond line color 100% brown pattern 232-B dash length 1.75 mm; spacing .5 mm; lineweight .2 mm	
30.2.44	Outline of glacier or permanent snowfield		color 100% cyan lineweight .2 mm dash length 1.75 mm; spacing .5 mm	
30.2.45	Outline of glacier or permanent snowfield—Form lines show glacial trend		pattern 522-C (rotated perpendicular to glacial trend)	
30.2.46	Marsh, wetland, swamp, or bog		pattern 420-C	
30.2.47	Mangrove area		pattern 424-C	
30.2.48	Rice field		pattern 423-C	

30—TOPOGRAPHIC AND HYDROGRAPHIC FEATURES (continued)

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
30.3—Miscellaneous topographic and hydrographic features				
30.3.1	Open pit mine or quarry, as shown on topographic maps or on general-purpose or smaller scale maps	Quarry	H-7 → Quarry draft as shown	
30.3.2	Gravel, sand, clay, or borrow pit, as shown on topographic maps or on general-purpose or smaller scale maps	Gravel Pit	H-7 → Gravel Pit 2.235 mm .75 mm line weight .15 mm	
30.3.3	Adit or mine tunnel entrance, as shown on topographic maps or on general-purpose or smaller scale maps	Mine	H-7 → Mine all line weights .15 mm 2.225 mm 1.175 mm 1.75 mm 55°	Rotate symbol so that long line points in direction of cave or mine entrance.
30.3.4	Cave entrance, as shown on topographic maps or on general-purpose or smaller scale maps	Cave	H-7 → Cave	
30.3.5	Prospect, as shown on topographic maps or on general-purpose or smaller scale maps	Prospect	H-7 → Prospect line weight .15 mm 1.75 mm 45°	
30.3.6	Mine shaft, as shown on topographic maps or on general-purpose or smaller scale maps—Showing name	Garnet Mine	line weight .15 mm 1.0 mm Garnet Mine ← H-7	
30.3.7	Landmark object, as shown on topographic maps or on general-purpose or smaller scale maps	Lookout	H-7 → Lookout dot diameter .225 mm line weight .15 mm circle diameter 1.0 mm	Add label for type of object (as is shown for example of "lookout").
30.3.8	Windmill, as shown on topographic maps or on general-purpose or smaller scale maps	Windmill	H-7 → Windmill 1.125 mm 1.25 mm windmill arm angles 110°, 70° .675 mm line weight .15 mm	
30.3.9	Oil or gas well, as shown on topographic maps or on general-purpose or smaller scale maps	Well	H-7 → Well circle diameter 1.0 mm line weight .15 mm	
30.3.10	Water well, as shown on topographic maps or on general-purpose or smaller scale maps	Well	H-7 → Well circle diameter 1.0 mm line color 100% cyan line weight .2 mm	
30.3.11	Geothermal well, as shown on topographic maps or on general-purpose or smaller scale maps	Geothermal	H-7 → Geothermal circle diameter 1.0 mm line color 100% cyan line weight .2 mm	
30.3.12	Spring, as shown on topographic maps or on general-purpose or smaller scale maps	Spring	circle diameter 1.0 mm H-7 → Spring draft "tail" as shown line color 100% cyan line weight .2 mm	
30.3.13	Geyser, fumarole, mud pot, or thermal spring, as shown on topographic maps or on general-purpose or smaller scale maps	Geyser	H-7 → Geyser circle diameter 1.0 mm line color 100% cyan line weight .2 mm	
30.3.14	Gaging station, as shown on topographic maps or on general-purpose or smaller scale maps	Gaging Station	H-7 → Gaging Station circle diameter 1.25 mm line weight .15 mm	
30.3.15	Pumping station, as shown on topographic maps or on general-purpose or smaller scale maps	Pumping Station	H-7 → Pumping Station 1.125 mm .875 mm	
30.3.16	Rock	Rock	H-7 → Rock 60° line weight .2 mm 1.25 mm	
30.3.17	Exposed wreck		line weight .15 mm draft as shown	
30.3.18	Coral reef	Coral	H-7 → Coral line weight .15 mm	
30.3.19	Shoal	Shoal	dash length .2 mm; spacing .425 mm Shoal ← H-7 line weight .2 mm	
30.3.20	Ruins	Ruins	dash length 1.0 mm; spacing .5 mm Ruins ← H-7 line weight .15 mm	
30.3.21	Power transmission line		line weight .125 mm dot diameter .425 mm .825 mm 1.425 mm	
30.3.22	Telephone line	TELEPHONE	line weight .125 mm TELEPHONE ← HI-5 dash length 2.5 mm; space .5 mm	
30.3.23	Underground gas or oil pipeline	PIPELINE	PIPELINE ← HI-5 line weight .125 mm	
30.3.24	Aboveground gas or oil pipeline	ABOVEGROUND PIPELINE	ABOVEGROUND PIPELINE ← HI-5 line weight .125 mm	

31 — MISCELLANEOUS MAP ELEMENTS

REF NO	DESCRIPTION	SYMBOL	CARTOGRAPHIC SPECIFICATIONS*	NOTES ON USAGE*
31.1	Township and range line—Definite		<i>line and text color 100% red</i>	<p>On larger scale maps (for example, 1:24,000 scale), usually every section (nos. 1–36) is numbered.</p> <p>On smaller scale maps (for example, 1:100,000 scale), usually only corner sections (nos. 1, 6, 31, 36) are numbered (type size may be decreased if necessary).</p> <p>Every township and range, regardless of scale, should be numbered.</p> <p>May also be shown in 50% black, especially if contours or other base-map information is shown in 50% black (see Section 30.1).</p>
31.2	Township and range line—Location approximate		<i>lineweight .275 mm</i>	
31.3	Township label	T 32 N	<i>lineweight .15 mm</i>	
31.4	Range label	R 44 E	<i>lineweight .15 mm; dash length 2.5 mm; space .5 mm</i>	
31.5	Section line—Definite		<i>lineweight .275 mm; dash length 2.5 mm; space .5 mm</i>	
31.6	Section line—Location approximate		<i>lineweight .15 mm; dash length 2.5 mm; space .5 mm</i>	
31.7	Section number	5		
31.8	Map neatline		<i>lineweight .25 mm</i>	
31.9	Map neatline—Showing latitude or longitude tick and value	40°37'30"	<i>lineweight .25 mm</i>	
31.10	Cross section line and label	A—A'	<i>lineweight .2 mm</i>	
31.11	Leader		<i>lineweight .175 mm</i>	
31.12	Map-unit label (add leader where necessary)		<i>contact [lineweight .15 mm]</i> <i>leader [lineweight .175 mm]</i>	
31.13	Map-unit label containing geologic age character (add leader where necessary)		<i>FG-8</i> <i>H-8</i> <i>Mzv</i> <i>H-8</i> <i>FG-8</i>	<p>Patterns should overprint other map units. Do not outline with contact (use scratch boundary instead). May be shown in other colors.</p>
31.14	Area of outcrop (1st option)		<i>100% black</i>	
31.15	Area of outcrop (2nd option)		<i>scratch boundary [lineweight 0.0 mm]</i> <i>50% black</i>	
31.16	Area of outcrop (3rd option)		<i>100% red</i>	
31.17	Area of outcrop (4th option)		<i>50% red</i>	
31.18	Area of outcrop in surficial deposits (1st option)		<i>pattern 134-K</i>	
31.19	Area of outcrop in surficial deposits (2nd option)		<i>pattern 134-K in 50% black</i>	
31.20	Area of outcrop in surficial deposits (3rd option)		<i>pattern 134-R</i>	<p>May be shown in red or other colors.</p>
31.21	Sample locality—Showing sample number	● 98-103	<i>dot diameter 1.25 mm</i> <i>H-7</i>	
31.22	Field station locality, as shown on small-scale maps or on page-size illustrations	•	<i>dot diameter .5 mm</i>	
31.23	Chronostratigraphic zone, chronozone, or stage boundary		<i>dot diameter .5 mm; spacing .5 mm</i> <i>color 100% red</i>	
31.24	Chronostratigraphic-zone, chronozone, or stage boundary—Showing names of stratigraphic ages	Aptian Albian	<i>Aptian</i> <i>Albian</i> <i>H-8</i> <i>color 100% red</i>	<p>May be shown in black or other colors.</p> <p>Names may either be placed along zone boundary or within zones.</p>

*For more information, see general guidelines on pages A-i to A-v.

32—GEOLOGIC AGE SYMBOL FONT ("FGDC-GeoAge")

REF NO	STRATIGRAPHIC AGE	SUBDIVISION TYPE	AGE SYMBOL*	KEYBOARD POSITION FOR "FGDC-GeoAge" FONT*
32.1	Cenozoic	Era	Cz	{ (left curly bracket = shift-left square bracket)
32.2	Quaternary	Period	Q	No keyboard substitution needed (or, use Helvetica)
32.3	Tertiary	Period	T	No keyboard substitution needed (or, use Helvetica)
32.4	Neogene	Subperiod	N	No keyboard substitution needed (or, use Helvetica)
32.5	Paleogene	Subperiod	Pē	: (colon = shift-semi-colon)
32.6	Mesozoic	Era	Mz	} (right curly bracket = shift-right square bracket)
32.7	Cretaceous	Period	K	No keyboard substitution needed (or, use Helvetica)
32.8	Jurassic	Period	J	No keyboard substitution needed (or, use Helvetica)
32.9	Triassic	Period	Tṛ	^ (caret = shift-6)
32.10	Paleozoic	Era	Pz	(vertical line = shift-backslash)
32.11	Permian	Period	P	No keyboard substitution needed (or, use Helvetica)
32.12	Carboniferous	Period	C	No keyboard substitution needed (or, use Helvetica)
32.13	Pennsylvanian	Period	IP	* (asterisk = shift-8)
32.14	Mississippian	Period	M	No keyboard substitution needed (or, use Helvetica)
32.15	Devonian	Period	D	No keyboard substitution needed (or, use Helvetica)
32.16	Silurian	Period	S	No keyboard substitution needed (or, use Helvetica)
32.17	Ordovician	Period	O	No keyboard substitution needed (or, use Helvetica)
32.18	Cambrian	Period	€	_ (underscore = shift-hyphen)
32.19	Precambrian	Era	p€	= (equal sign)
32.20	Proterozoic	Eon	P	< ("less than" sign = shift-comma)
32.21	Late Proterozoic	Era	Z	No keyboard substitution needed (or, use Helvetica)
32.22	Middle Proterozoic	Era	Y	No keyboard substitution needed (or, use Helvetica)
32.23	Late Middle Proterozoic	Era	Y³	E (capital E = shift-e)
32.24	Middle Middle Proterozoic	Era	Y²	F (capital F = shift-f)

*For more information, see general guidelines on pages A-i to A-v.

32—GEOLOGIC AGE SYMBOL FONT ("FGDC-GeoAge") (continued)

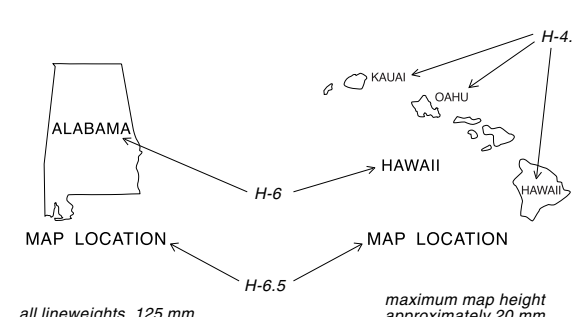
REF NO	STRATIGRAPHIC AGE	SUBDIVISION TYPE	AGE SYMBOL*	KEYBOARD POSITION FOR "FGDC-GeoAge" FONT*
32.25	Early Middle Proterozoic	Era	Y ¹	G (capital G = shift-g)
32.26	Early Proterozoic	Era	X	No keyboard substitution needed (or, use Helvetica)
32.27	Late Early Proterozoic	Era	X ³	I (capital I = shift-i)
32.28	Middle Early Proterozoic	Era	X ²	L (capital L = shift-l)
32.29	Early Early Proterozoic	Era	X ¹	R (capital R = shift-r)
32.30	Archean	Eon	A	No keyboard substitution needed (or, use Helvetica)
32.31	Late Archean	Era	W	No keyboard substitution needed (or, use Helvetica)
32.32	Middle Archean	Era	V	No keyboard substitution needed (or, use Helvetica)
32.33	Early Archean	Era	U	No keyboard substitution needed (or, use Helvetica)
32.34	pre-Archean	Eon	pA	B (capital B = shift-b)

**For more information, see general guidelines on pages A-i to A-v.*

33—SUGGESTED RANGES OF MAP-UNIT COLORS FOR VOLCANIC AND PLUTONIC ROCKS AND FOR STRATIGRAPHIC AGES OF SEDIMENTARY AND METAMORPHIC ROCKS

CMYK* values (K = 0): A = 8%; 1 = 13%; 2 = 20%; 3 = 30%; 4 = 40%; 5 = 50%; 6 = 60%; 7 = 70%; X = 100%									
33.1—Suggested range of map-unit colors for volcanic and plutonic rocks*									
010	030	050	070	0X0	057	07X	036	047	05X
A60	270	3X0	150	370	5X0	033	055	077	0XX
33.2—Suggested range of map-unit colors for stratigraphic ages of sedimentary and metamorphic rocks*									
Q 007	001		0A6		005		003		
T 037	0A3	A4X	A37	026	014	A25	024		
K 507	104	517		415		406	305		
J 604	202		705		504		303		
Ṛ 602	20A		6A3		402		301		
P 600	300		701		501		40A		
Ṗ 620	4A0		72A		61A		510		
M 431	21A		531		42A		32A		
D 540	220		650		440		330		
S 350	A20		460		34A		230		
O 051	02A		A51		041		031		
€ 054	022		A54		043		A33		
p€ 446	A11	455	344	233	122	121			
	A12	457	346	235	124	A13			
	1A3	537	436	326	324	214			
	1AA	533	433	422	322	211			

34—STATE LOCATION MAPS

CARTOGRAPHIC SPECIFICATIONS	NOTES ON USAGE
 <p>all lineweights .125 mm</p> <p>maximum map height approximately 20 mm</p>	<p>State location maps are at various scales; projection is Albers Equal-Area, based on parallels 29 1/2° and 45 1/2°.</p> <p>Maps are modified from the United States Base Map (U.S. Geological Survey, 1965, scale 1:3,168,000) and the Digital Shaded-Relief Image of Alaska (J.R. Riehle and others, 1997, U.S. Geological Survey Miscellaneous Investigations Map I-2585, scale 1:2,500,000; see fig. 2, approximate scale 1:8,000,000).</p> <p>To show a quadrangle or map-area location, place a small black-filled rectangle (■) or polygon (▣) that shows the approximate location within state (adjust size and shape accordingly). Reposition state name if necessary.</p> <p>If a quadrangle or map-area location is within two or more adjoining states, create one new location map that contains each state. Extract states from location map of 48 conterminous states (see Section 34.2). Rotate new location map so that it is approximately horizontal, and resize it so that it is about 2–2.5 cm high. Add rectangle or polygon showing location of mapped area, then add names to each state. Center "MAP LOCATION" below new location map.</p>

34.1—Individual states; District of Columbia; Guam; Puerto Rico; U.S. Virgin Islands

 <p>ALABAMA</p> <p>MAP LOCATION</p>	 <p>ALASKA</p> <p>MAP LOCATION</p>	 <p>ARIZONA</p> <p>MAP LOCATION</p>	 <p>ARKANSAS</p> <p>MAP LOCATION</p>	
 <p>CALIF.</p> <p>MAP LOCATION</p>	 <p>COLORADO</p> <p>MAP LOCATION</p>	 <p>CONNECTICUT</p> <p>MAP LOCATION</p>	 <p>DEL.</p> <p>MAP LOCATION</p>	 <p>DISTRICT OF COLUMBIA</p> <p>MAP LOCATION</p>
 <p>FLORIDA</p> <p>MAP LOCATION</p>	 <p>GEORGIA</p> <p>MAP LOCATION</p>	 <p>GUAM</p> <p>MAP LOCATION</p>	 <p>KAUAI OAHU HAWAII HAWAII</p> <p>MAP LOCATION</p>	 <p>IDAHO</p> <p>MAP LOCATION</p>
 <p>ILLINOIS</p> <p>MAP LOCATION</p>	 <p>INDIANA</p> <p>MAP LOCATION</p>	 <p>IOWA</p> <p>MAP LOCATION</p>	 <p>KANSAS</p> <p>MAP LOCATION</p>	 <p>KENTUCKY</p> <p>MAP LOCATION</p>
 <p>LOUISIANA</p> <p>MAP LOCATION</p>	 <p>MAINE</p> <p>MAP LOCATION</p>	 <p>MARYLAND</p> <p>MAP LOCATION</p>	 <p>MASSACHUSETTS</p> <p>MAP LOCATION</p>	 <p>MICHIGAN</p> <p>MAP LOCATION</p>

34—STATE LOCATION MAPS (continued)

34.1—Individual states; District of Columbia; Guam; Puerto Rico; U.S. Virgin Islands (continued)



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



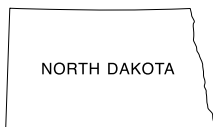
MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



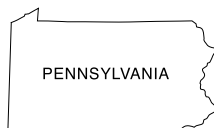
MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



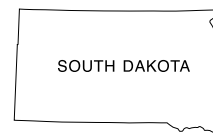
MAP LOCATION



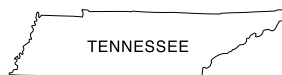
MAP LOCATION



MAP LOCATION



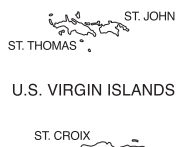
MAP LOCATION



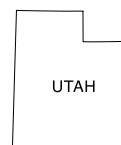
MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



MAP LOCATION



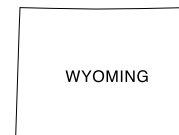
MAP LOCATION



MAP LOCATION



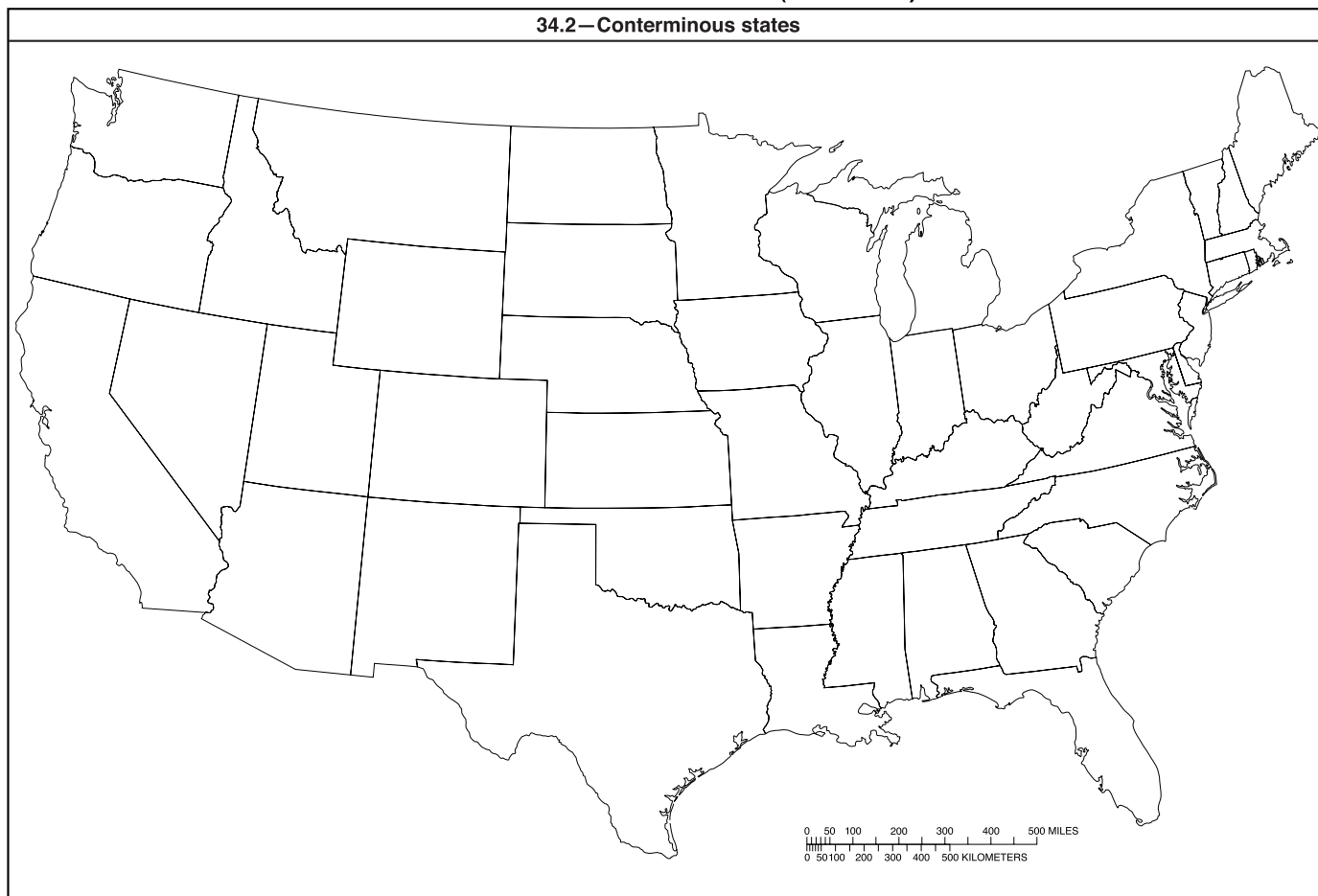
MAP LOCATION



MAP LOCATION

34—STATE LOCATION MAPS (continued)

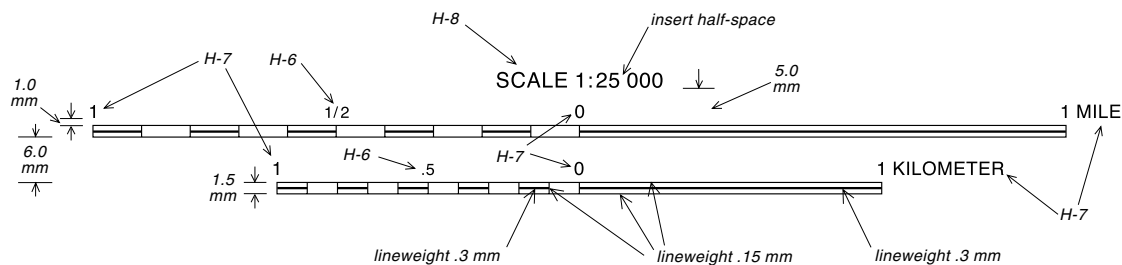
34.2—Conterminous states



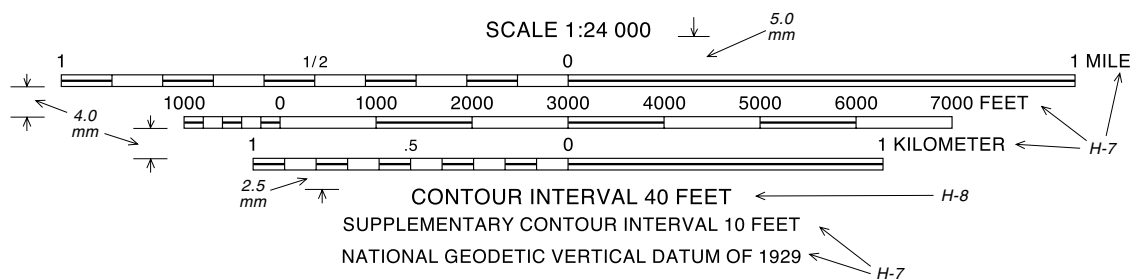
35—BAR SCALES

CARTOGRAPHIC SPECIFICATIONS

2 UNITS OF MEASUREMENT:



3 UNITS OF MEASUREMENT:



DISTANCE MEASURES

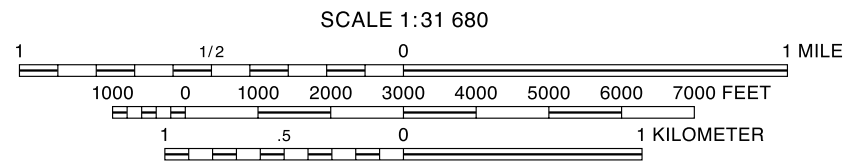
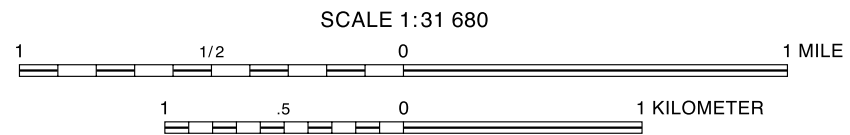
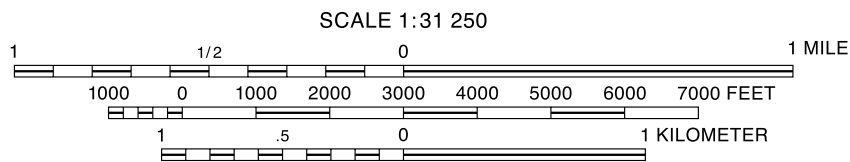
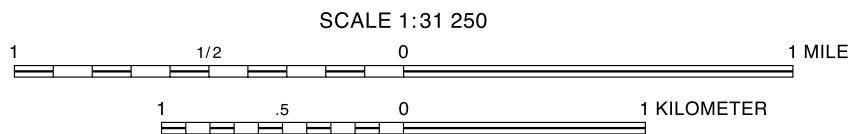
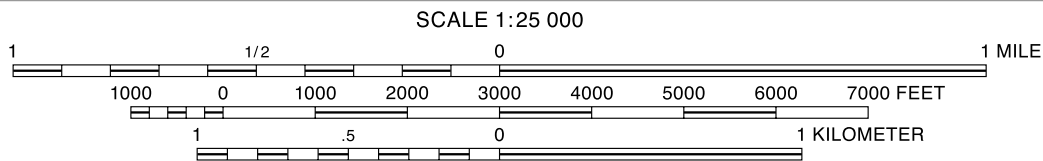
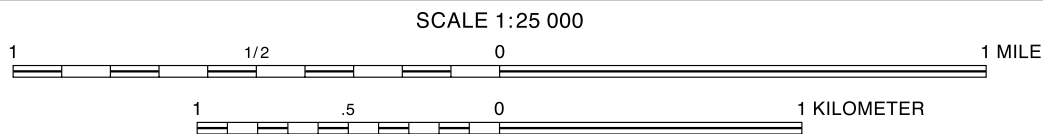
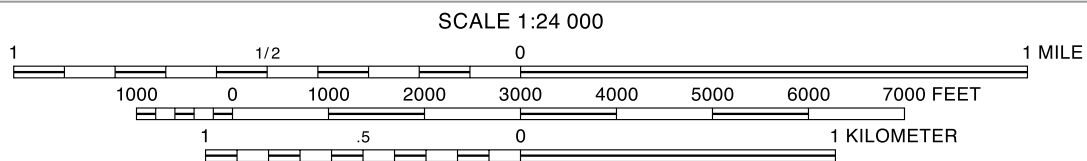
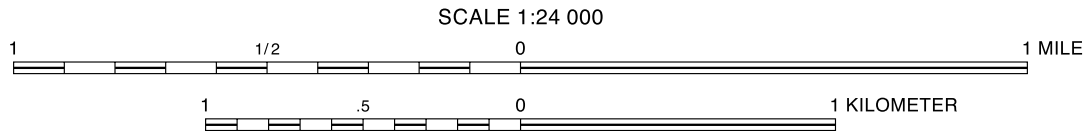
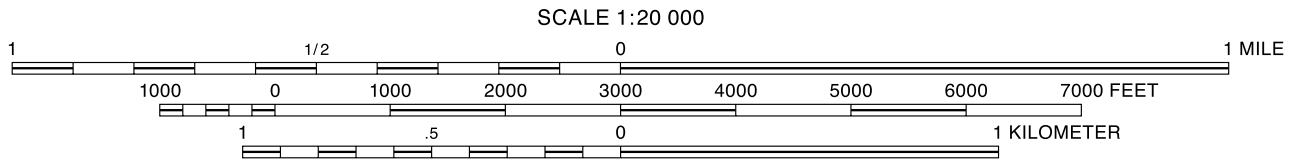
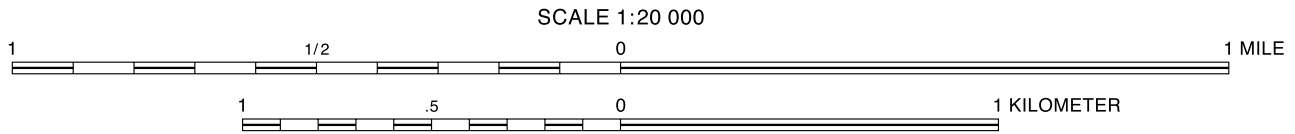
1 mile (mi)	= 63,360 inches (in)
	= 5,280 feet (ft)
1 kilometer (km)	= 3,280.833 ft
	= 0.62137 mi

MEASUREMENT EQUIVALENTS

Metric	English
1 millimeter (mm)	= 1/10 cm
	= 1/1000 m
1 centimeter (cm)	= 10 mm
	= 1/100 m
1 meter (m)	= 100 cm
	= 1,000 mm
	= 1/1,000 km
1 kilometer (km)	= 1,000 m
	= 100,000 cm
	= 1,000,000 mm

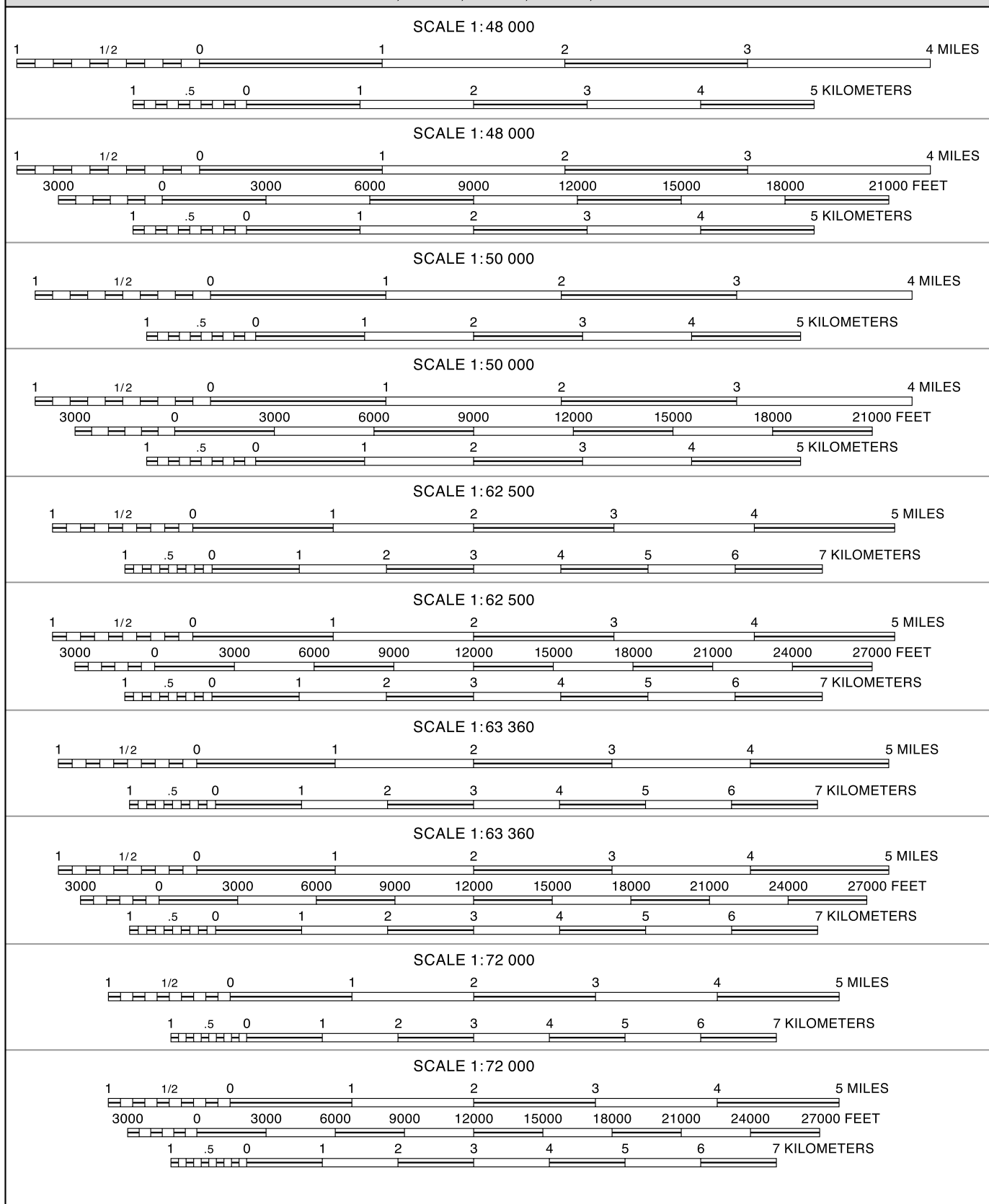
35—BAR SCALES (continued)

1:20 000, 1:24 000, 1:25 000, 1:31 250, 1:31 680



35—BAR SCALES (continued)

1:48 000, 1:50 000, 1:62 500, 1:63 360, 1:72 000



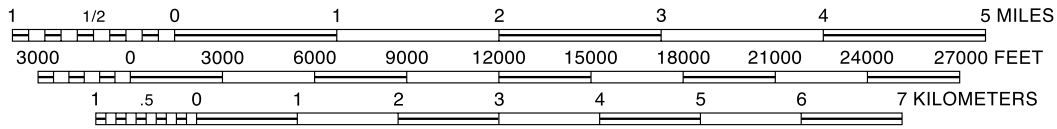
35—BAR SCALES (continued)

1:75 000, 1:96 000, 1:100 000, 1:125 000, 1:150 000, 1:250 000, 1:400 000, 1:500 000, 1:750 000

SCALE 1:75 000



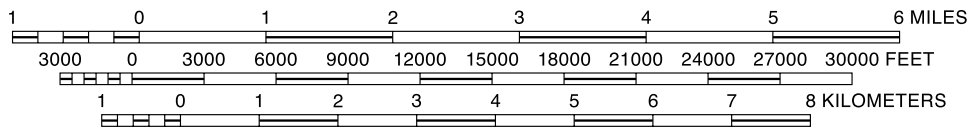
SCALE 1:75 000



SCALE 1:96 000



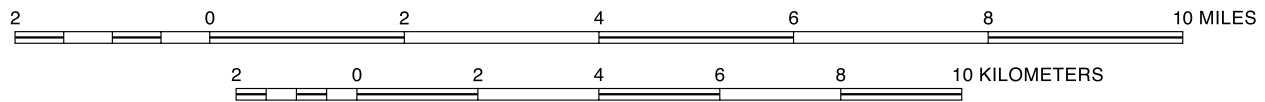
SCALE 1:96 000



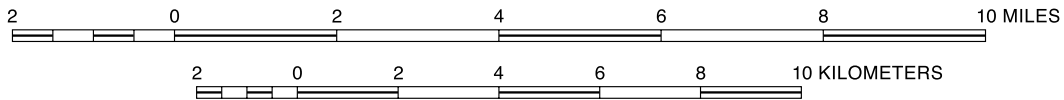
SCALE 1:100 000



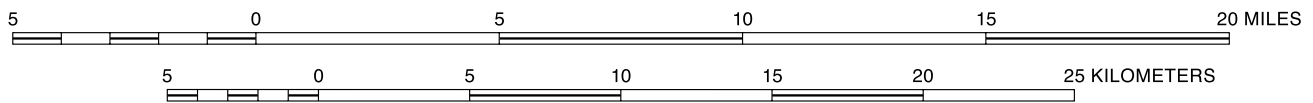
SCALE 1:125 000



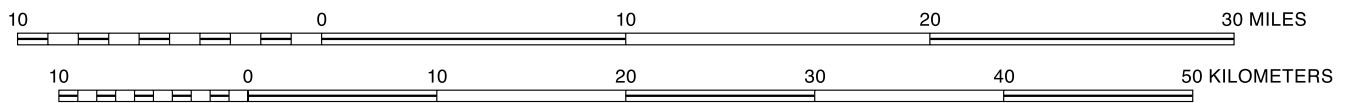
SCALE 1:150 000



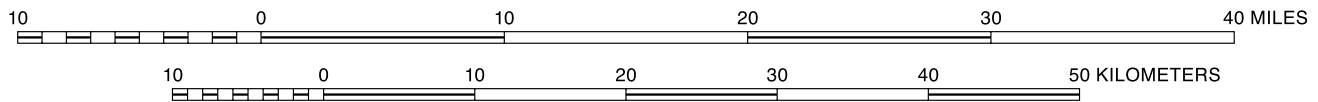
SCALE 1:250 000



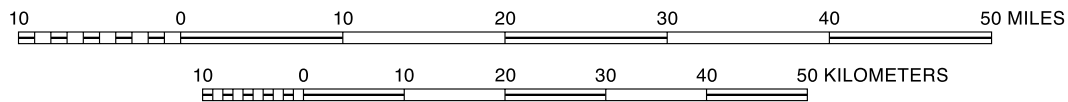
SCALE 1:400 000



SCALE 1:500 000

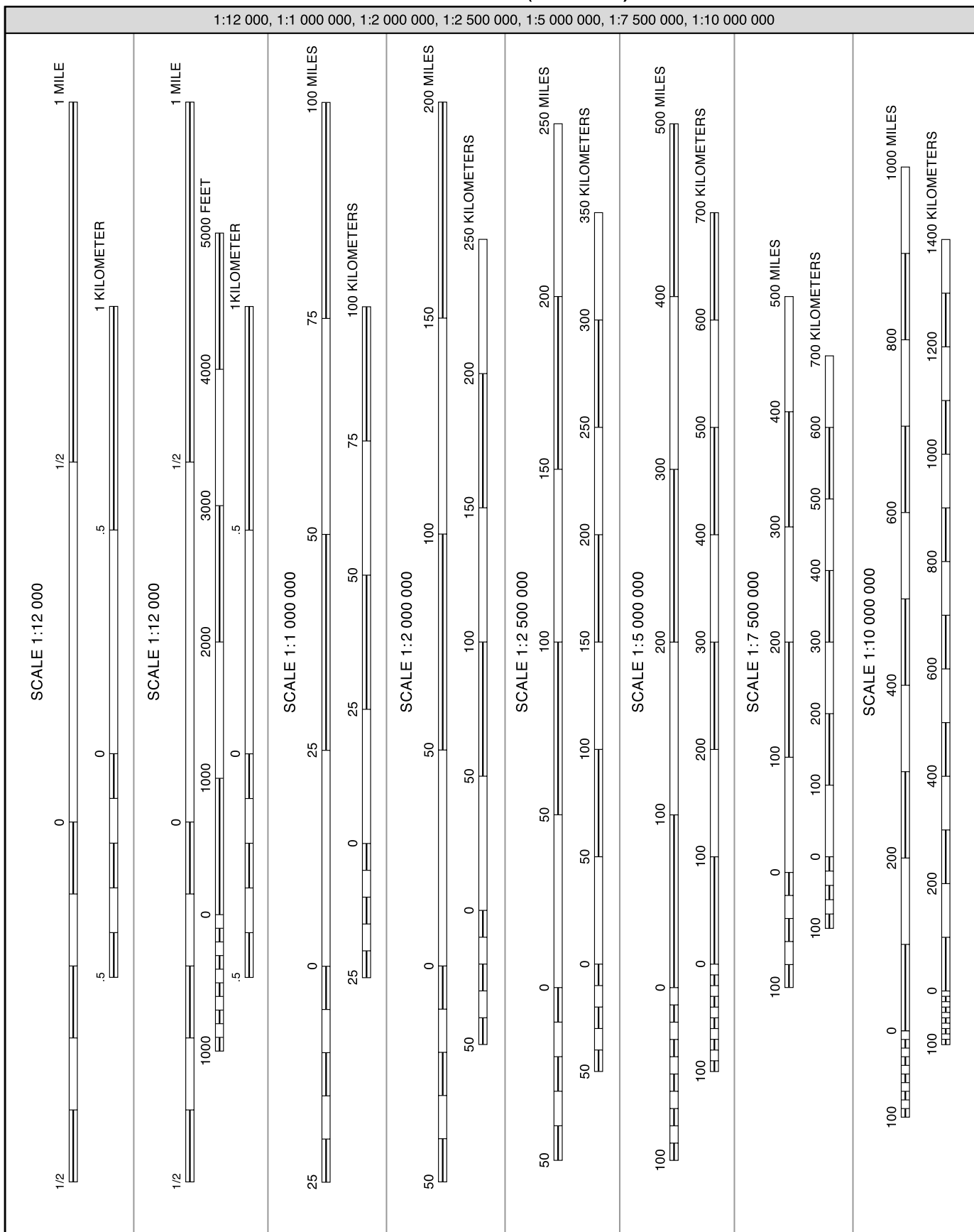


SCALE 1:750 000



35—BAR SCALES (continued)

1:12 000, 1:1 000 000, 1:2 000 000, 1:2 500 000, 1:5 000 000, 1:7 500 000, 1:10 000 000



35—BAR SCALES (continued)

BAR SCALE CALCULATIONS — MILES (1 mile = 63,360 inches)							
FRACTIONAL SCALE	SCALE TO MAP REPRESENTATION		TO FIND MILES PER INCH (x in ratio)	MILES PER INCH	TOTAL MILES ON SCALE	TO FIND TOTAL SCALE LENGTH IN INCHES (y in ratio)	TOTAL SCALE LENGTH (INCHES)
	Scale Unit :	represents Map Unit	Use ratio below or $\frac{\text{SCALE}}{63\ 360}$			Use ratio below or $\frac{\text{Miles on scale}}{\text{Miles per inch}}$	
1:12 000	1inch	12 000 in	$\frac{63\ 360}{1} = \frac{12\ 000}{x}$	0.1893939	1.5	$\frac{0.1893939}{1} = \frac{1.5}{y}$	7.920
1:20 000	1inch	20 000 in	$\frac{63\ 360}{1} = \frac{20\ 000}{x}$	0.3156565	2	$\frac{0.3156565}{1} = \frac{2}{y}$	6.336
1:24 000	1inch	24 000 in	$\frac{63\ 360}{1} = \frac{24\ 000}{x}$	0.3787878	2	$\frac{0.3787878}{1} = \frac{2}{y}$	5.280
1:25 000	1inch	25 000 in	$\frac{63\ 360}{1} = \frac{25\ 000}{x}$	0.3945707	2	$\frac{0.3945707}{1} = \frac{2}{y}$	5.068
1:31 250	1inch	31 250 in	$\frac{63\ 360}{1} = \frac{31\ 250}{x}$	0.4932133	2	$\frac{0.4932133}{1} = \frac{2}{y}$	4.055
1:31 680	1inch	31 680 in	$\frac{63\ 360}{1} = \frac{31\ 680}{x}$	0.500	2	$\frac{0.500}{1} = \frac{2}{y}$	4.000
1:48 000	1inch	48 000 in	$\frac{63\ 360}{1} = \frac{48\ 000}{x}$	0.7575757	5	$\frac{0.7575757}{1} = \frac{5}{y}$	6.600
1:50 000	1inch	50 000 in	$\frac{63\ 360}{1} = \frac{50\ 000}{x}$	0.7891414	5	$\frac{0.7891414}{1} = \frac{5}{y}$	6.336
1:62 500	1inch	62 500 in	$\frac{63\ 360}{1} = \frac{62\ 500}{x}$	0.9864267	6	$\frac{0.9864267}{1} = \frac{6}{y}$	6.082
1:63 360	1inch	63 360 in	$\frac{63\ 360}{1} = \frac{63\ 360}{x}$	1.000	6	$\frac{1.000}{1} = \frac{6}{y}$	6.000
1:72 000	1inch	72 000 in	$\frac{63\ 360}{1} = \frac{72\ 000}{x}$	1.1363636	6	$\frac{1.1363636}{1} = \frac{6}{y}$	5.280
1:75 000	1inch	75 000 in	$\frac{63\ 360}{1} = \frac{75\ 000}{x}$	1.1837121	6	$\frac{1.1837121}{1} = \frac{6}{y}$	5.068
1:96 000	1inch	96 000 in	$\frac{63\ 360}{1} = \frac{96\ 000}{x}$	1.5151515	7	$\frac{1.5151515}{1} = \frac{7}{y}$	4.620
1:100 000	1inch	100 000 in	$\frac{63\ 360}{1} = \frac{100\ 000}{x}$	1.5782828	9	$\frac{1.5782828}{1} = \frac{9}{y}$	5.702
1:125 000	1inch	125 000 in	$\frac{63\ 360}{1} = \frac{125\ 000}{x}$	1.9728535	12	$\frac{1.9728535}{1} = \frac{12}{y}$	6.082
1:150 000	1inch	150 000 in	$\frac{63\ 360}{1} = \frac{150\ 000}{x}$	2.3674242	12	$\frac{2.3674242}{1} = \frac{12}{y}$	5.068
<p>To find miles per inch on 1: 12 000 map . . .</p> <p>63,360 inches = 1 mile Show in ratio as ... $\frac{63\ 360}{1} \text{ inches}$ 1 miles</p> <p>Let SCALE (12 000) be in inches Fractional scale says 1 inch represents 12,000 in Let x be miles that 1 inch represents on map Show in ratio as ... $\frac{12\ 000}{x} \text{ inches}$ $x \text{ miles}$</p> <p>Solution . . .</p> $\frac{63\ 360}{1} = \frac{12\ 000}{x}$ $\frac{63\ 360 \cdot x}{63\ 360} = \frac{12\ 000 \cdot 1}{63\ 360}$ $x = \frac{12\ 000}{63\ 360} \text{ (SCALE)}$ $x = 0.1893939$							

35—BAR SCALES (continued)

BAR SCALE CALCULATIONS — MILES (1 mile = 63,360 inches)—continued							
FRACTIONAL SCALE	SCALE TO MAP REPRESENTATION		TO FIND MILES PER INCH (x in ratio)	MILES PER INCH	TOTAL MILES ON SCALE	TO FIND TOTAL SCALE LENGTH IN INCHES (y in ratio)	TOTAL SCALE LENGTH (INCHES)
	Scale Unit	represents Map Unit	Use ratio below or $\frac{\text{SCALE}}{63\,360}$			Use ratio below or $\frac{\text{Miles on scale}}{\text{Miles per inch}}$	
1:250 000	1inch	250 000 in	$\frac{63\,360}{1} = \frac{250\,000}{x}$	3.945707	25	$\frac{3.945707}{1} = \frac{25}{y}$	6.336
1:400 000	1inch	400 000 in	$\frac{63\,360}{1} = \frac{400\,000}{x}$	6.3131313	40	$\frac{6.3131313}{1} = \frac{40}{y}$	6.336
1:500 000	1inch	500 000 in	$\frac{63\,360}{1} = \frac{500\,000}{x}$	7.8914141	50	$\frac{7.8914141}{1} = \frac{50}{y}$	6.336
1:750 000	1inch	750 000 in	$\frac{63\,360}{1} = \frac{750\,000}{x}$	11.837121	60	$\frac{11.837121}{1} = \frac{60}{y}$	5.068
1:1 000 000	1inch	1 000 000 in	$\frac{63\,360}{1} = \frac{1\,000\,000}{x}$	15.782828	125	$\frac{15.782828}{1} = \frac{125}{y}$	7.920
1:2 000 000	1inch	2 000 000 in	$\frac{63\,360}{1} = \frac{2\,000\,000}{x}$	31.565656	250	$\frac{31.565656}{1} = \frac{250}{y}$	7.920
1:2 500 000	1inch	2 500 000 in	$\frac{63\,360}{1} = \frac{2\,500\,000}{x}$	39.45707	300	$\frac{39.45707}{1} = \frac{300}{y}$	7.603
1:5 000 000	1inch	5 000 000 in	$\frac{63\,360}{1} = \frac{5\,000\,000}{x}$	78.914141	600	$\frac{78.914141}{1} = \frac{600}{y}$	7.603
1:7 500 000	1inch	7 500 000 in	$\frac{63\,360}{1} = \frac{7\,500\,000}{x}$	118.37121	600	$\frac{118.37121}{1} = \frac{600}{y}$	5.068
1:10 000 000	1inch	10 000 000 in	$\frac{63\,360}{1} = \frac{10\,000\,000}{x}$	157.82828	1100	$\frac{157.82828}{1} = \frac{1100}{y}$	6.969
<p>To find miles per inch on 1: 250 000 map . . .</p> <p>63,360 inches = 1 mile Show in ratio as ... $\frac{63\,360}{1} \quad \begin{array}{l} \text{inches} \\ \text{miles} \end{array}$</p> <p>Let SCALE (250 000) be in inches Fractional scale says 1 inch represents 250,000 in Let x be miles that 1 inch represents on map Show in ratio as ... $\frac{250\,000}{x} \quad \begin{array}{l} \text{inches} \\ \text{miles} \end{array}$</p> <p>Solution . . .</p> $\frac{63\,360}{1} = \frac{250\,000}{x}$ $63\,360 \cdot x = 250\,000 \cdot 1$ $\frac{63\,360 \cdot x}{63\,360} = \frac{250\,000}{63\,360}$ $x = \frac{250\,000}{63\,360} \text{ (SCALE)}$ $x = 3.945707$							

35—BAR SCALES (continued)

BAR SCALE CALCULATIONS — FEET (1 foot = 12 inches)							
FRACTIONAL SCALE	SCALE TO MAP REPRESENTATION		TO FIND FEET PER INCH (x in ratio)	FEET PER INCH	TOTAL FEET ON SCALE	TO FIND TOTAL SCALE LENGTH IN INCHES (y in ratio)	TOTAL SCALE LENGTH (INCHES)
	Scale Unit :	represents Map Unit	Use ratio below or $\frac{\text{SCALE}}{12}$			Use ratio below or $\frac{\text{Feet on scale}}{\text{Feet per inch}}$	
1:12 000	1inch	12 000 in	$\frac{12}{1} = \frac{12\ 000}{x}$	1000.000	6000	$\frac{1000.000}{1} = \frac{6000}{y}$	6.000
1:20 000	1inch	20 000 in	$\frac{12}{1} = \frac{20\ 000}{x}$	1666.6666	8000	$\frac{1666.6666}{1} = \frac{8000}{y}$	4.800
1:24 000	1inch	24 000 in	$\frac{12}{1} = \frac{24\ 000}{x}$	2000.000	8000	$\frac{2000.000}{1} = \frac{8000}{y}$	4.000
1:25 000	1inch	25 000 in	$\frac{12}{1} = \frac{25\ 000}{x}$	2083.3333	8000	$\frac{2083.3333}{1} = \frac{8000}{y}$	3.840
1:31 250	1inch	31 250 in	$\frac{12}{1} = \frac{31\ 250}{x}$	2604.1666	8000	$\frac{2604.1666}{1} = \frac{8000}{y}$	3.072
1:31 680	1inch	31 680 in	$\frac{12}{1} = \frac{31\ 680}{x}$	2640.000	8000	$\frac{2640.000}{1} = \frac{8000}{y}$	3.030
1:48 000	1inch	48 000 in	$\frac{12}{1} = \frac{48\ 000}{x}$	4000.000	24 000	$\frac{4000.000}{1} = \frac{24\ 000}{y}$	6.000
1:50 000	1inch	50 000 in	$\frac{12}{1} = \frac{50\ 000}{x}$	4166.6666	24 000	$\frac{4166.6666}{1} = \frac{24\ 000}{y}$	5.760
1:62 500	1inch	62 500 in	$\frac{12}{1} = \frac{62\ 500}{x}$	5208.3333	30 000	$\frac{5208.3333}{1} = \frac{30\ 000}{y}$	5.760
1:63 360	1inch	63 360 in	$\frac{12}{1} = \frac{63\ 360}{x}$	5280.000	30 000	$\frac{5280.000}{1} = \frac{30\ 000}{y}$	5.681
1:72 000	1inch	72 000 in	$\frac{12}{1} = \frac{72\ 000}{x}$	6000.000	30 000	$\frac{6000.000}{1} = \frac{30\ 000}{y}$	5.000
1:75 000	1inch	75 000 in	$\frac{12}{1} = \frac{75\ 000}{x}$	6250.000	30 000	$\frac{6250.000}{1} = \frac{30\ 000}{y}$	4.800
1:96 000	1inch	96 000 in	$\frac{12}{1} = \frac{96\ 000}{x}$	8000.000	33 000	$\frac{8000.000}{1} = \frac{33\ 000}{y}$	4.125
<div> <div> To find feet per inch on 1: 12 000 map . . . 12 inches = 1 foot Show in ratio as ... $\frac{12}{1} \frac{\text{inches}}{\text{feet}}$ </div> <div> Let SCALE (12 000) be in inches Fractional scale says 1 inch represents 12,000 in Let x be feet that 1 inch represents on map Show in ratio as ... $\frac{12\ 000}{x} \frac{\text{inches}}{\text{feet}}$ </div> </div> <div> Solution . . . $\frac{12}{1} = \frac{12\ 000}{x}$ </div> <div> $12 \cdot x = 12\ 000 \cdot 1$ $\frac{12\ x = 12\ 000}{12 \quad 12}$ $x = \frac{12\ 000}{12}$ (SCALE) $x = 1000.00$ </div>							

35—BAR SCALES (continued)

BAR SCALE CALCULATIONS — KILOMETERS (1 kilometer = 100,000 centimeters)								
FRACTIONAL SCALE	SCALE TO MAP REPRESENTATION		TO FIND KILOMETERS PER CENTIMETER (CM) (x in ratio)	KILOMETERS PER CM	TOTAL KILOMETERS ON SCALE	TO FIND TOTAL SCALE LENGTH IN CENTIMETERS (y in ratio)	TOTAL SCALE LENGTH IN	
	Scale Unit :	represents Map Unit	Use ratio below or $\frac{\text{SCALE}}{100\,000}$			Use ratio below or $\frac{\text{Kilometers on scale}}{\text{Kilometers per cm}}$	CENTI-METERS	MILLI-METERS
1:12 000	1cm	12 000 cm	$\frac{100\,000}{1} = \frac{12\,000}{x}$	0.120	1.5	$\frac{0.120}{1} = \frac{1.5}{y}$	12.500	125.00
1:20 000	1cm	20 000 cm	$\frac{100\,000}{1} = \frac{20\,000}{x}$	0.200	2	$\frac{0.200}{1} = \frac{2}{y}$	10.000	100.00
1:24 000	1cm	24 000 cm	$\frac{100\,000}{1} = \frac{24\,000}{x}$	0.240	2	$\frac{0.240}{1} = \frac{2}{y}$	8.333	83.33
1:25 000	1cm	25 000 cm	$\frac{100\,000}{1} = \frac{25\,000}{x}$	0.250	2	$\frac{0.250}{1} = \frac{2}{y}$	8.000	80.00
1:31 250	1cm	31 250 cm	$\frac{100\,000}{1} = \frac{31\,250}{x}$	0.3125	2	$\frac{0.3125}{1} = \frac{2}{y}$	6.400	64.00
1:31 680	1cm	31 680 cm	$\frac{100\,000}{1} = \frac{31\,680}{x}$	0.3168	2	$\frac{0.3168}{1} = \frac{2}{y}$	6.313	63.13
1:48 000	1cm	48 000 cm	$\frac{100\,000}{1} = \frac{48\,000}{x}$	0.480	6	$\frac{0.480}{1} = \frac{6}{y}$	12.500	125.00
1:50 000	1cm	50 000 cm	$\frac{100\,000}{1} = \frac{50\,000}{x}$	0.500	6	$\frac{0.500}{1} = \frac{6}{y}$	12.000	120.00
1:62 500	1cm	62 500 cm	$\frac{100\,000}{1} = \frac{62\,500}{x}$	0.625	8	$\frac{0.625}{1} = \frac{8}{y}$	12.800	128.00
1:63 360	1cm	63 360 cm	$\frac{100\,000}{1} = \frac{63\,360}{x}$	0.6336	8	$\frac{0.6336}{1} = \frac{8}{y}$	12.626	126.26
1:72 000	1cm	72 000 cm	$\frac{100\,000}{1} = \frac{72\,000}{x}$	0.720	8	$\frac{0.720}{1} = \frac{8}{y}$	11.111	111.11
1:75 000	1cm	75 000 cm	$\frac{100\,000}{1} = \frac{75\,000}{x}$	0.750	8	$\frac{0.750}{1} = \frac{8}{y}$	10.666	106.66
1:96 000	1cm	96 000 cm	$\frac{100\,000}{1} = \frac{96\,000}{x}$	0.960	9	$\frac{0.960}{1} = \frac{9}{y}$	9.375	93.75
1:100 000	1cm	100 000 cm	$\frac{100\,000}{1} = \frac{100\,000}{x}$	1.000	11	$\frac{1.000}{1} = \frac{11}{y}$	11.000	110.00
1:125 000	1cm	125 000 cm	$\frac{100\,000}{1} = \frac{125\,000}{x}$	1.250	12	$\frac{1.250}{1} = \frac{12}{y}$	9.600	96.00
1:150 000	1cm	150 000 cm	$\frac{100\,000}{1} = \frac{150\,000}{x}$	1.500	12	$\frac{1.500}{1} = \frac{12}{y}$	8.000	80.00
<p>To find kilometers per centimeter on 1: 12 000 map . . .</p> <p>100 000 centimeters = 1 kilometer Show in ratio as ...</p> $\frac{100\,000}{1} \frac{\text{centimeters}}{\text{kilometers}}$ <p>Let SCALE (12 000) be in centimeters Fractional scale says 1 centimeter represents 12,000 centimeters Let x be kilometers that 1 cm represents on map Show in ratio as ...</p> $\frac{12\,000}{x} \frac{\text{centimeters}}{\text{kilometers}}$ <p>Solution . . .</p> $\frac{100\,000}{1} = \frac{12\,000}{x}$ $\frac{100\,000}{100\,000} x = \frac{12\,000}{100\,000}$ $x = \frac{12\,000}{100\,000} \text{ (SCALE)}$ $x = 0.120$ <p>100 000 • x = 12 000 • 1</p>								

35—BAR SCALES (continued)

BAR SCALE CALCULATIONS — KILOMETERS (1 kilometer = 100,000 centimeters)—continued								
FRACTIONAL SCALE	SCALE TO MAP REPRESENTATION		TO FIND KILOMETERS PER CENTIMETER (CM) (x in ratio)	KILOMETERS PER CM	TOTAL KILOMETERS ON SCALE	TO FIND TOTAL SCALE LENGTH IN CENTIMETERS (y in ratio)	TOTAL SCALE LENGTH IN	
	Scale Unit	represents Map Unit	Use ratio below or $\frac{\text{SCALE}}{100\,000}$			Use ratio below or $\frac{\text{Kilometers on scale}}{\text{Kilometers per cm}}$	CENTI-METERS	MILLI-METERS
1:250 000	1cm	250 000 cm	$\frac{100\,000}{1} = \frac{250\,000}{x}$	2.500	30	$\frac{2.500}{1} = \frac{30}{y}$	12.000	120.00
1:400 000	1cm	400 000 cm	$\frac{100\,000}{1} = \frac{400\,000}{x}$	4.000	60	$\frac{4.000}{1} = \frac{60}{y}$	15.000	150.00
1:500 000	1cm	500 000 cm	$\frac{100\,000}{1} = \frac{500\,000}{x}$	5.000	60	$\frac{5.000}{1} = \frac{60}{y}$	12.000	120.00
1:750 000	1cm	750 000 cm	$\frac{100\,000}{1} = \frac{750\,000}{x}$	7.500	60	$\frac{7.500}{1} = \frac{60}{y}$	8.000	80.00
1:1 000 000	1cm	1 000 000 cm	$\frac{100\,000}{1} = \frac{1\,000\,000}{x}$	10.000	125	$\frac{10.000}{1} = \frac{125}{y}$	12.500	125.00
1:2 000 000	1cm	2 000 000 cm	$\frac{100\,000}{1} = \frac{2\,000\,000}{x}$	20.000	300	$\frac{20.000}{1} = \frac{300}{y}$	15.000	150.00
1:2 500 000	1cm	2 500 000 cm	$\frac{100\,000}{1} = \frac{2\,500\,000}{x}$	25.000	400	$\frac{25.000}{1} = \frac{400}{y}$	16.000	160.00
1:5 000 000	1cm	5 000 000 cm	$\frac{100\,000}{1} = \frac{5\,000\,000}{x}$	50.000	800	$\frac{50.000}{1} = \frac{800}{y}$	16.000	160.00
1:7 500 000	1cm	7 500 000 cm	$\frac{100\,000}{1} = \frac{7\,500\,000}{x}$	75.000	800	$\frac{75.000}{1} = \frac{800}{y}$	10.666	106.66
1:10 000 000	1cm	10 000 000 cm	$\frac{100\,000}{1} = \frac{10\,000\,000}{x}$	100.000	1500	$\frac{100.000}{1} = \frac{1500}{y}$	15.000	150.00
<p>To find kilometers per centimeter on 1: 250 000 map . . .</p> <p>100 000 centimeters = 1 kilometer Show in ratio as ... $\frac{100\,000}{1} \frac{\text{centimeters}}{\text{kilometers}}$</p> <p>Let SCALE (250 000) be in centimeters Fractional scale says 1 centimeter represents 250,000 centimeters Let x be kilometers that 1 cm represents on map Show in ratio as ... $\frac{250\,000}{x} \frac{\text{centimeters}}{\text{kilometers}}$</p> <p>Solution . . .</p> $\frac{100\,000}{1} = \frac{250\,000}{x}$ $\frac{100\,000}{100\,000} x = \frac{250\,000}{100\,000}$ $x = \frac{250\,000}{100\,000} \text{ (SCALE)}$ $x = 2.5$ <p>100 000 • x = 250 000 • 1</p>								

36—MEAN DECLINATION ARROWS

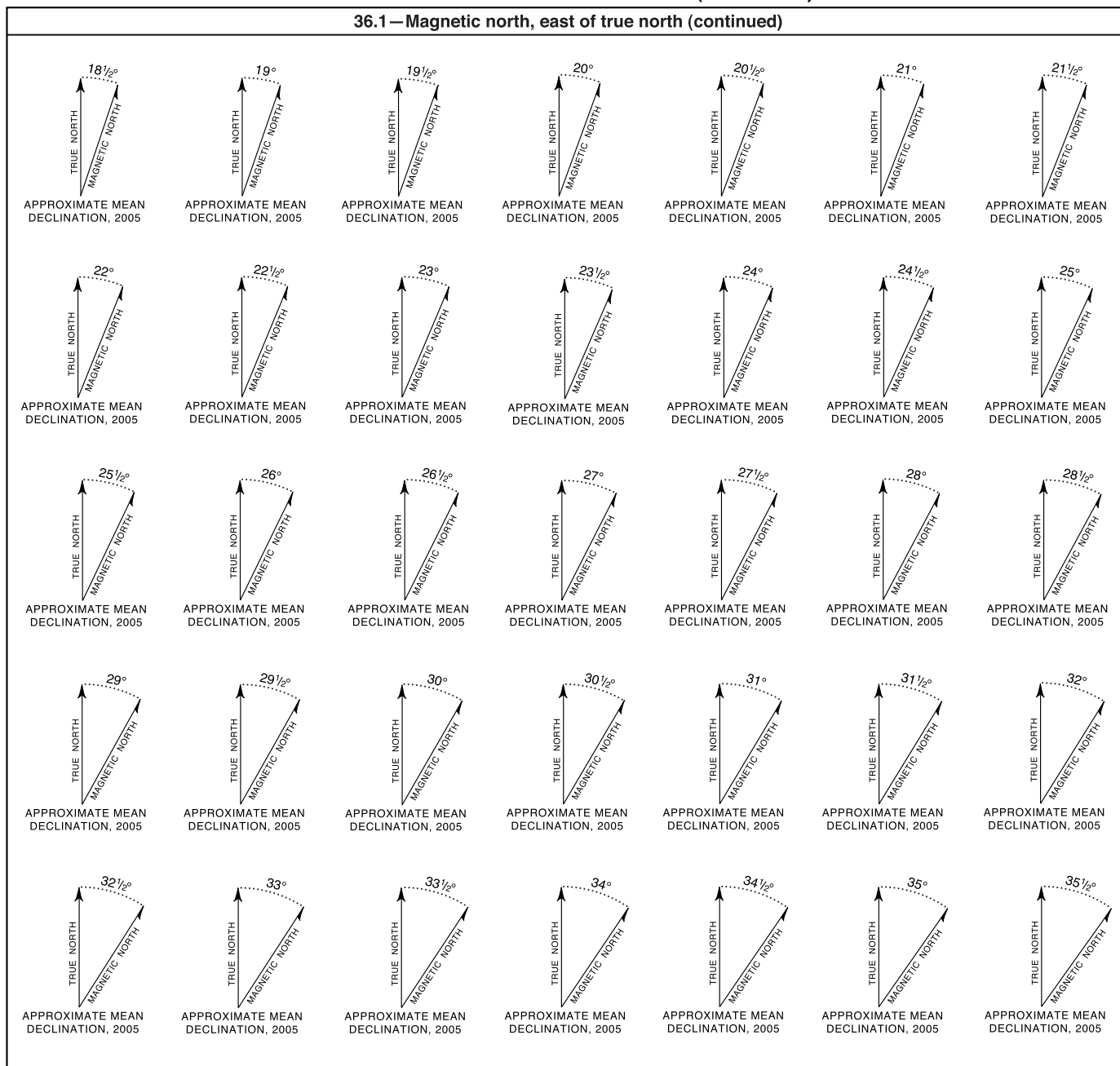
CARTOGRAPHIC SPECIFICATIONS	NOTES ON USAGE
	<p>Because magnetic declination changes over time, the degree of declination should be determined at the time of publication, and the year of the declination measurement should be changed to the year of publication.</p> <p>In northern latitudes where the change in declination can be significant, it may be helpful to also note what the degree of declination was at the time of mapping, especially if the geologic information was gathered several years before the date of publication.</p>

36.1—Magnetic north, east of true north

<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>
<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>
<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>
<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>
<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>	<p>APPROXIMATE MEAN DECLINATION, 2005</p>

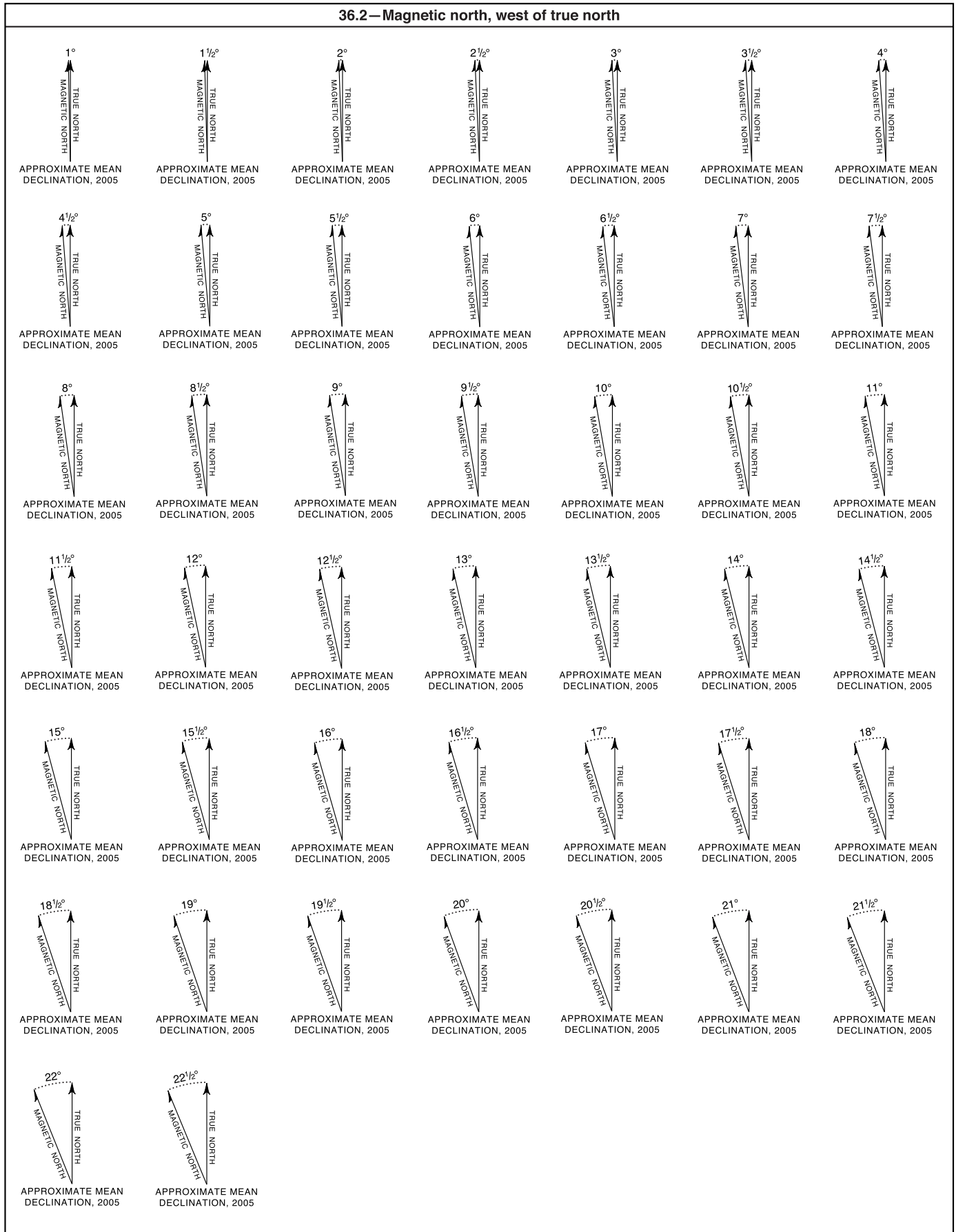
36—MEAN DECLINATION ARROWS (continued)

36.1—Magnetic north, east of true north (continued)



36—MEAN DECLINATION ARROWS (continued)

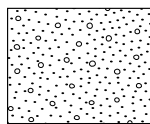
36.2—Magnetic north, west of true north



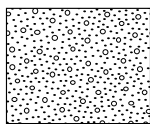
37—LITHOLOGIC PATTERNS

[Lithologic patterns are usually reserved for use on stratigraphic columns, sections, or charts]

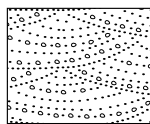
37.1—Sedimentary-rock lithologic patterns



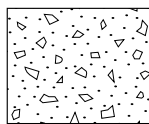
601
Gravel or
conglomerate
(1st option)



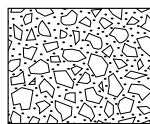
602
Gravel or
conglomerate
(2nd option)



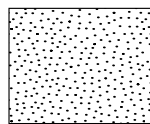
603
Crossbedded gravel
or conglomerate



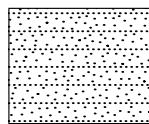
605
Breccia (1st option)



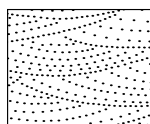
606
Breccia (2nd option)



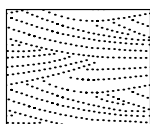
607
Massive sand or
sandstone



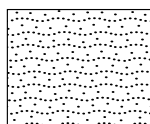
608
Bedded sand or
sandstone



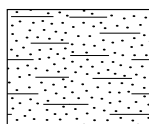
609
Crossbedded sand
or sandstone
(1st option)



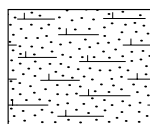
610
Crossbedded sand
or sandstone
(2nd option)



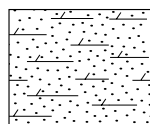
611
Ripple-bedded sand
or sandstone



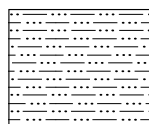
612
Argillaceous or
shaly sandstone



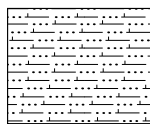
613
Calcareous
sandstone



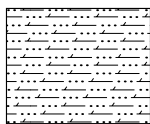
614
Dolomitic
sandstone



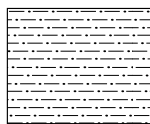
616
Silt, siltstone,
or shaly silt



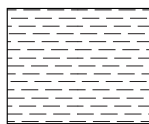
617
Calcareous
siltstone



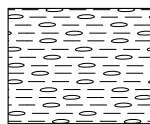
618
Dolomitic
siltstone



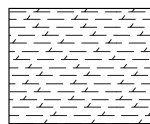
619
Sandy or silty
shale



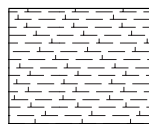
620
Clay or clay
shale



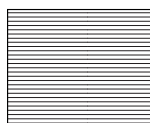
621
Cherty shale



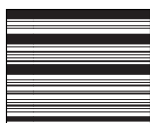
622
Dolomitic shale



623
Calcareous shale
or marl



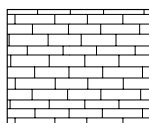
624
Carbonaceous
shale



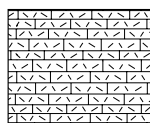
625
Oil shale



626
Chalk



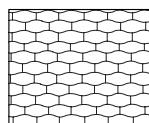
627
Limestone



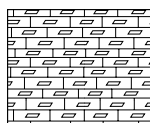
628
Clastic
limestone



629
Fossiliferous clastic
limestone



630
Nodular or irregularly
bedded limestone



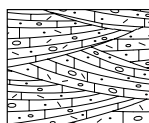
631
Limestone, irregular
(burrow?) fillings of
saccharoidal dolomite



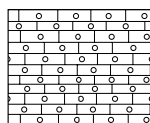
632
Crossbedded
limestone



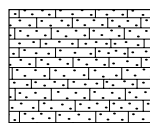
633
Cherty crossbedded
limestone



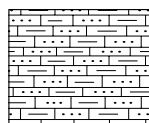
634
Cherty and sandy
crossbedded
clastic limestone



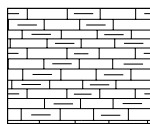
635
Oolitic
limestone



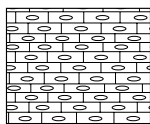
636
Sandy limestone



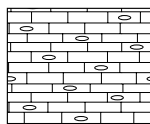
637
Silty limestone



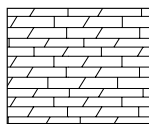
638
Argillaceous or
shaly limestone



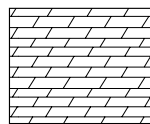
639
Cherty limestone
(1st option)



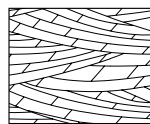
640
Cherty limestone
(2nd option)



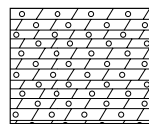
641
Dolomitic limestone,
limy dolomite, or
limy dolomite



642
Dolostone or
dolomite



643
Crossbedded
dolostone or
dolomite



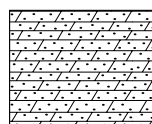
644
Oolitic dolostone
or dolomite

*For more information, see general guidelines on pages A-i to A-v.

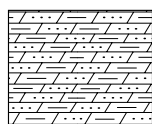
37—LITHOLOGIC PATTERNS (continued)

[Lithologic patterns are usually reserved for use on stratigraphic columns, sections, or charts]

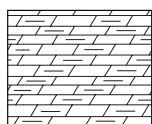
37.1—Sedimentary-rock lithologic patterns (continued)



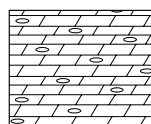
645
Sandy dolomite
or dolomite



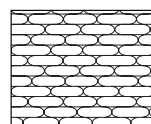
646
Silty dolomite
or dolomite



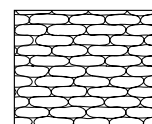
647
Argillaceous or
shaly dolomite
or dolomite



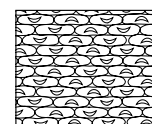
648
Cherty dolomite
or dolomite



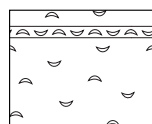
649
Bedded chert
(1st option)



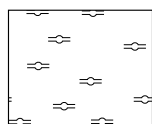
650
Bedded chert
(2nd option)



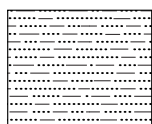
651
Fossiliferous
bedded chert



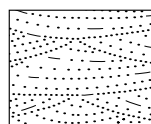
652
Fossiliferous rock



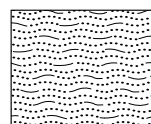
653
Diatomaceous
rock



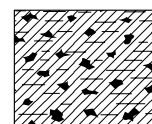
654
Subgraywacke



655
Crossbedded
subgraywacke



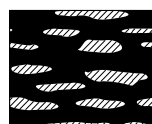
656
Ripple-bedded
subgraywacke



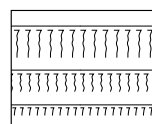
657
Peat



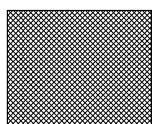
658
Coal



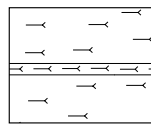
659
Bony coal or
impure coal



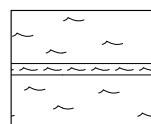
660
Underclay



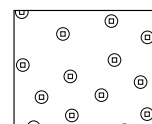
661
Flint clay



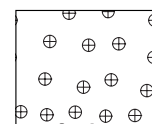
662
Bentonite



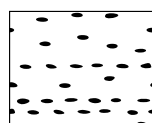
663
Glauconite



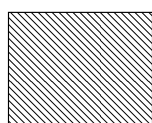
664
Limonite



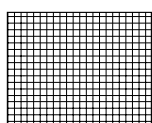
665
Siderite



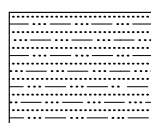
666
Phosphatic-nodular
rock



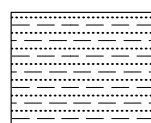
667
Gypsum



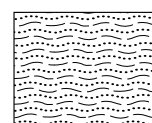
668
Salt



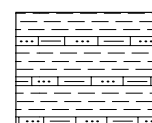
669
Interbedded
sandstone and
siltstone



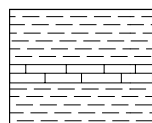
670
Interbedded
sandstone and
shale



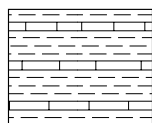
671
Interbedded ripple-
bedded sandstone
and shale



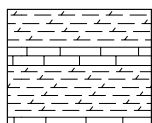
672
Interbedded shale
and silty limestone
(shale dominant)



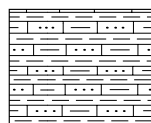
673
Interbedded shale
and limestone
(shale dominant)
(1st option)



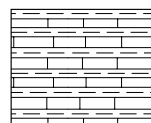
674
Interbedded shale
and limestone
(shale dominant)
(2nd option)



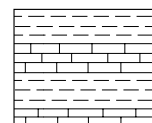
675
Interbedded calc-
areous shale and
limestone (shale
dominant)



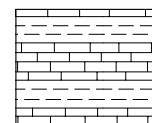
676
Interbedded
silty limestone
and shale



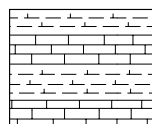
677
Interbedded
limestone and
shale (1st option)



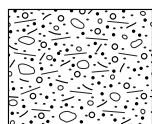
678
Interbedded
limestone and
shale (2nd option)



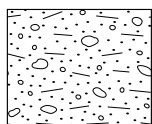
679
Interbedded
limestone and shale
(limestone dominant)



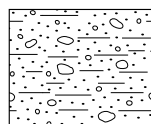
680
Interbedded
limestone and
calcareous shale



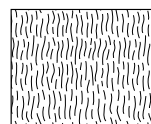
681
Till or diamicton
(1st option)



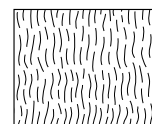
682
Till or diamicton
(2nd option)



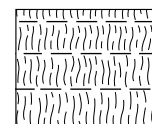
683
Till or diamicton
(3rd option)



684
Loess (1st option)



685
Loess (2nd option)



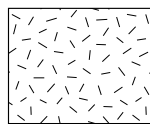
686
Loess (3rd option)

*For more information, see general guidelines on pages A-i to A-v.

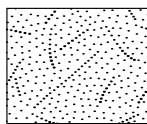
37—LITHOLOGIC PATTERNS (continued)

[Lithologic patterns are usually reserved for use on stratigraphic columns, sections, or charts]

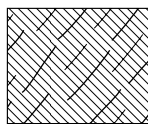
37.2—Metamorphic-rock, igneous-rock, and vein-matter lithologic patterns



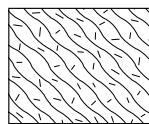
701
Metamorphism



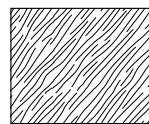
702
Quartzite



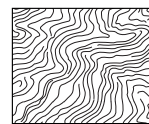
703
Slate



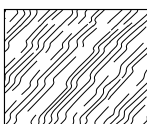
704
Schistose or
gneissoid granite



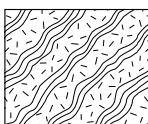
705
Schist



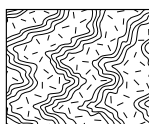
706
Contorted schist



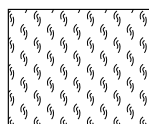
707
Schist and gneiss



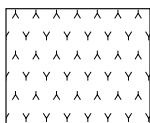
708
Gneiss



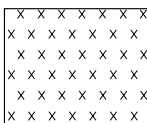
709
Contorted gneiss



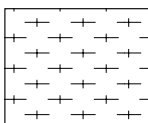
710
Soapstone, talc,
or serpentine



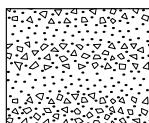
711
Tuffaceous rock



712
Crystal tuff



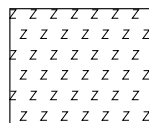
713
Devitrified
tuff



714
Volcanic breccia
and tuff



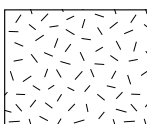
715
Volcanic breccia
or agglomerate



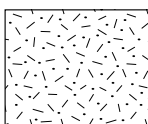
716
Zeolitic rock



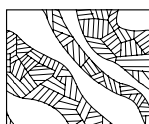
717
Basaltic flows



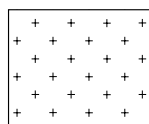
718
Granite (1st option)



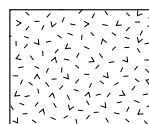
719
Granite (2nd option)



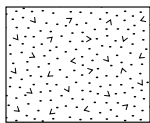
720
Banded
igneous rock



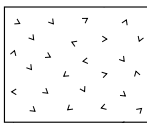
721
Igneous rock
(1st option)



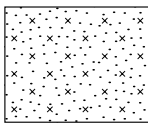
722
Igneous rock
(2nd option)



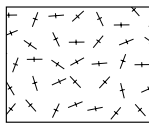
723
Igneous rock
(3rd option)



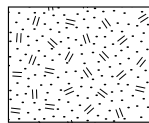
724
Igneous rock
(4th option)



725
Igneous rock
(5th option)



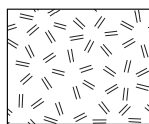
726
Igneous rock
(6th option)



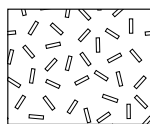
727
Igneous rock
(7th option)



728
Igneous rock
(8th option)



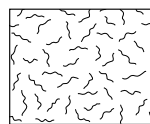
729
Porphyritic rock
(1st option)



730
Porphyritic rock
(2nd option)



731
Vitrophyre



732
Quartz



733
Ore

*For more information, see general guidelines on pages A-i to A-v.

38—EXPLANATION FOR PATTERN CHART

DISCUSSION*

This diagram provides some basic information on how to use the new Pattern Chart, which is enclosed in the sleeve on the inside back cover of this standard volume. For more specific information on the use of patterns (and color) on geologic maps, see Section 5, entitled "Guidelines for Map Color and Pattern Selection," in the accompanying introductory text.

Most patterns on this new chart were designed (in Adobe Illustrator 8.0.1) to closely replicate patterns in the informal "Technical Cartographic Standards" volume (U.S. Geological Survey, ca. 1975). In some cases, however, lineweights of pattern elements had to be increased to facilitate higher resolution (1800 dpi) digital output; therefore, some patterns may not plot or print correctly if output at lower resolutions.

Each pattern has been assigned a new pattern number (see below each box). In addition, each pattern now has associated with it a generic look-up table number that can be used to access a pattern if it has been incorporated into a patternset.

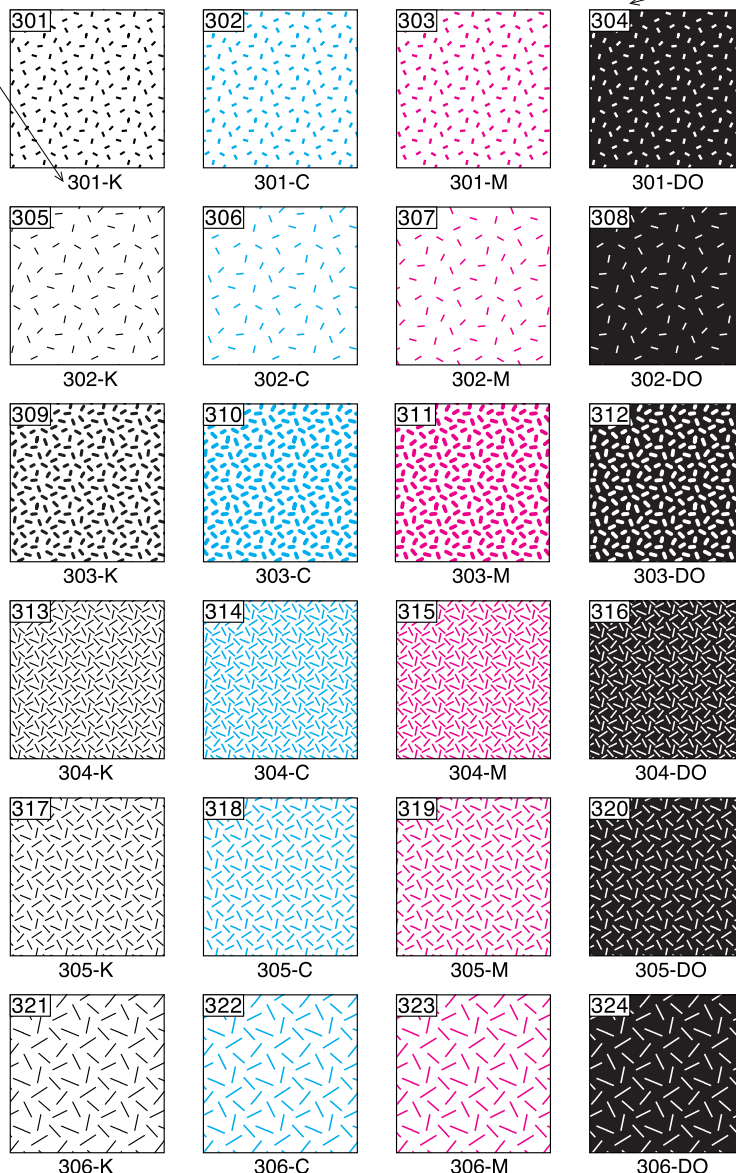
DESCRIPTION

Abbreviations used in pattern numbers:	<ul style="list-style-type: none"> • K, black; C, cyan; M, magenta; DO, dropout; R, red; B, brown
Overprint patterns have white background	<ul style="list-style-type: none"> • Pattern is in front. One bounding box (having Fill and Stroke set to 'None') is in back • White background is transparent (underlying map-unit color will be visible)
Dropout patterns have black background	<ul style="list-style-type: none"> • Pattern is in front. Two bounding boxes are in back: box directly beneath pattern has Fill set to 100% black and Stroke set to 'None'; box to rear has both Fill and Stroke set to 'None' • Black background represents underlying map-unit color. If white pattern is used "as is," it will knock out the underlying map-unit color; if pattern is changed to one of the CMYK values in the underlying map-unit color, it will knock out the other CMYK value(s) in map-unit color

IGNEOUS PATTERNS (Series 300)

Pattern number
shown below box

Generic lookup-table
number shown in upper left-hand
corner of box (can be used
to access a particular
pattern from a patternset)



39—EXPLANATION FOR CMYK COLOR CHART

DISCUSSION*

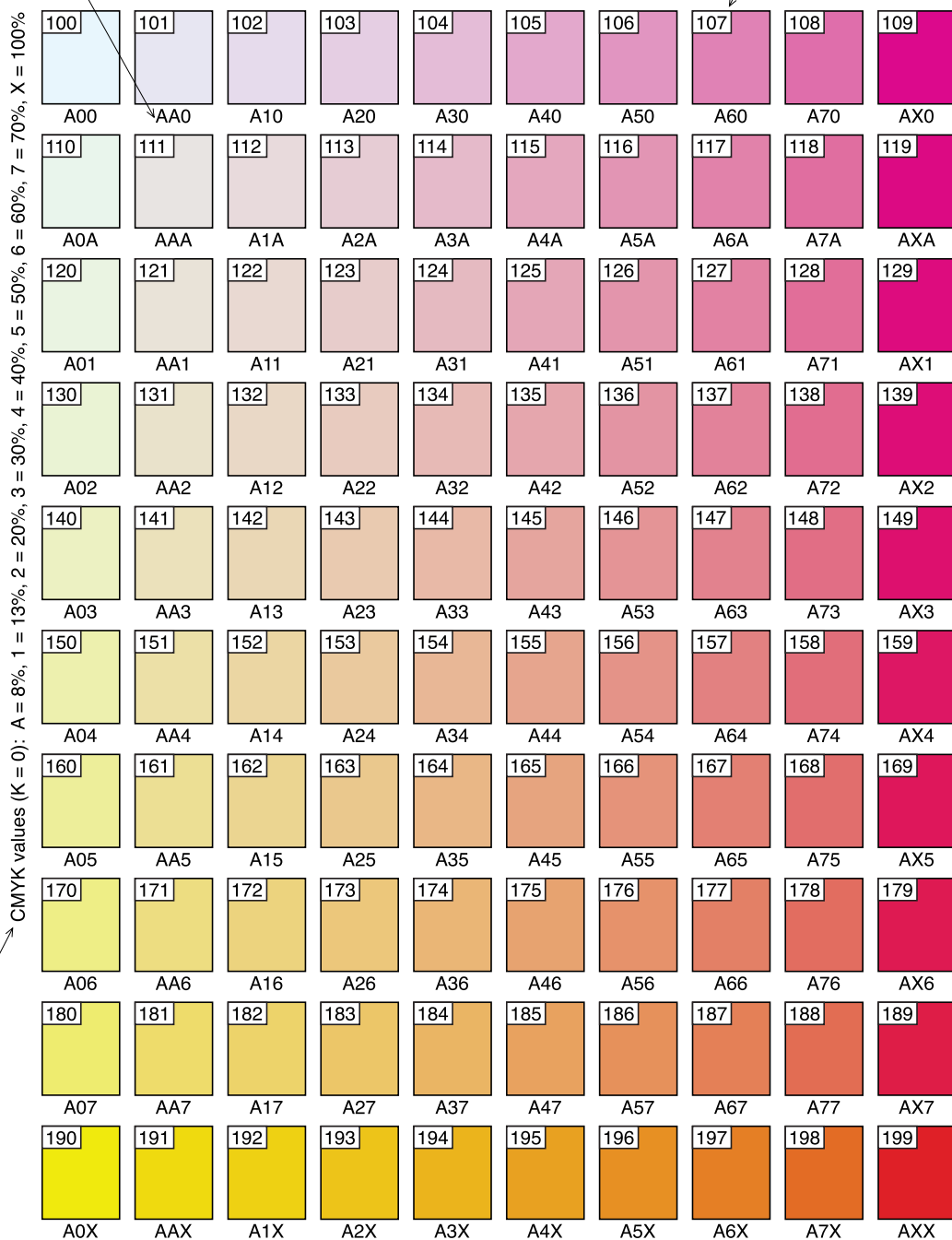
This diagram explains how to use the new CMYK Color Chart, which is enclosed in the sleeve on the inside back cover of this standard volume. For more specific information on the use of color (and patterns) on geologic maps, see Section 5, entitled "Guidelines for Map Color and Pattern Selection," in the accompanying introductory text.

This new CMYK Color Chart was designed in Adobe Illustrator 8.0.1 (Macintosh) to closely replicate the colors on the U.S. Geological Survey's original offset-printed process-ink color chart, entitled "Printing Colors and Screens in Use by the U.S. Geological Survey for Geologic and Hydrologic Maps" [yellow/magenta/cyan version], which has long been used at the USGS for choosing colors on geologic maps. The new color chart contains the same colors that were in the original offset-printed USGS color chart; however, the old color codes indicating the YMC (yellow/magenta/cyan) values have been updated to show CMYK (cyan/magenta/yellow, with K = 0) values, to conform to industry standards. In addition, each color now has associated with it a generic look-up table number that can be used to access a particular color if it has been incorporated into a shadeset.

CMYK (K = 0) value shown below box (see left side of diagram for explanation of abbreviations used)

Generic lookup-table number shown in upper left-hand corner of box (can be used to access a particular color from a shadeset)

8% CYAN WITH MAGENTA AND YELLOW



Abbreviations used to specify CMY values

**INDEX TO
INTRODUCTORY TEXT
AND APPENDIX A**

1702	INDEX TO INTRODUCTORY TEXT AND APPENDIX A		
1703		<i>Page</i>	<i>Ref. No.</i>
1704	Abandoned adit (1st option).....	A-19-3	19.3.12
1705	Abandoned adit (2nd option).....	A-19-3	19.3.17
1706	Abandoned clay pit.....	A-19-3	19.3.3
1707	Abandoned glory hole.....	A-19-3	19.3.5
1708	Abandoned gravel pit.....	A-19-3	19.3.3
1709	Abandoned open pit.....	A-19-3	19.3.5
1710	Abandoned placer pit.....	A-19-3	19.3.3
1711	Abandoned portal.....	A-19-3	19.3.22
1712	Abandoned quarry.....	A-19-3	19.3.5
1713	Abandoned sand pit.....	A-19-3	19.3.3
1714	Abandoned tunnel entrance (1st option).....	A-19-3	19.3.12
1715	Abandoned tunnel entrance (2nd option).....	A-19-3	19.3.17
1716	Abandoned vertical mine shaft, as shown on smaller scale or general-purpose maps.....	A-19-4	19.3.37
1717	Abbreviations used in this standard.....	A-v	Table 2
1718	About this version of the standard.....	A-ii	n/a
1719	Aboveground gas pipeline.....	A-30-6	30.3.24
1720	Aboveground oil pipeline.....	A-30-6	30.3.24
1721	Aboveground water pipeline.....	A-30-4	30.2.19
1722	Accommodating different values of the zone of confidence [concepts and definitions].....	30	n/a
1723	Acknowledgments.....	43	n/a
1724	Acritarchs.....	A-10-1	10.2.55
1725	Active convergent plate boundary—Accurately located.....	A-22-1	22.10
1726	Active convergent plate boundary—Approximately located.....	A-22-1	22.11
1727	Active convergent plate boundary, showing accretionary prism.....	A-22-1	22.12
1728	Active debris flow, showing a sharply defined morphology.....	A-17-3	17.56
1729	Active landslide (mapped to scale), showing a sharply defined morphology.....	A-17-3	17.58
1730	Active mid-oceanic ridge, with rift—Accurately located.....	A-22-1	22.1
1731	Active mid-oceanic ridge, with rift—Approximately located.....	A-22-1	22.2
1732	Active mid-oceanic ridge, without rift—Accurately located.....	A-22-1	22.3
1733	Active mid-oceanic ridge, without rift—Approximately located.....	A-22-1	22.4
1734	Active (operating) hazardous waste site.....	A-20-1	20.3
1735	Active quality-of-water site.....	A-26-6	26.4.3
1736	Active quality-of-water site, biological measurement.....	A-26-6	26.4.6
1737	Active quality-of-water site, biological measurement, equipped with a monitor.....	A-26-6	26.4.11
1738	Active quality-of-water site, chemical measurement.....	A-26-6	26.4.4
1739	Active quality-of-water site, chemical measurement, equipped with a monitor.....	A-26-6	26.4.9
1740	Active quality-of-water site, equipped with a monitor.....	A-26-6	26.4.8
1741	Active quality-of-water site, sediment measurement.....	A-26-6	26.4.7
1742	Active quality-of-water site, sediment measurement, equipped with a monitor.....	A-26-6	26.4.12

	<i>Page</i>	<i>Ref. No.</i>
1743		
1744	Active quality-of-water site, temperature measurement.....	A-26-6 26.4.5
1745	Active quality-of-water site, temperature measurement, equipped with a monitor.....	A-26-6 26.4.10
1746	Active spreading axis, with rift—Accurately located.....	A-22-1 22.1
1747	Active spreading axis, with rift—Approximately located.....	A-22-1 22.2
1748	Active spreading axis, without rift—Accurately located.....	A-22-1 22.3
1749	Active spreading axis, without rift—Approximately located.....	A-22-1 22.4
1750	Active transform fault, left-lateral offset—Accurately located.....	A-22-1 22.19
1751	Active transform fault, left-lateral offset—Approximately located.....	A-22-1 22.20
1752	Active transform fault, normal offset—Accurately located.....	A-22-1 22.21
1753	Active transform fault, normal offset—Approximately located.....	A-22-1 22.22
1754	Active transform fault, right-lateral offset—Accurately located.....	A-22-1 22.17
1755	Active transform fault, right-lateral offset—Approximately located.....	A-22-1 22.18
1756	Active transform fault, sense of offset unspecified—Accurately located.....	A-22-1 22.15
1757	Active transform fault, sense of offset unspecified—Approximately located.....	A-22-1 22.16
1758	Active volcano on small-scale maps.....	A-18-3 18.66
1759	Adit (1st option).....	A-19-3 19.3.9
1760	Adit (1st option), showing angle of inclination.....	A-19-3 19.3.13
1761	Adit (2nd option).....	A-19-3 19.3.14
1762	Adit (2nd option), showing angle of inclination.....	A-19-3 19.3.18
1763	Adit, as shown on topographic maps or on general-purpose or smaller scale maps.....	A-30-6 30.3.3
1764	Aeromagnetic survey.....	A-3-1 Sec. 3
1765	Age of contact [concepts and definitions].....	13 n/a
1766	Age of fault [concepts and definitions].....	16 n/a
1767	Age of fold [concepts and definitions].....	17 n/a
1768	Age of rock [influencing color and pattern selection].....	42 n/a
1769	Age symbol font.....	A-32-1 Sec. 32
1770	Ages of rock units [concepts and definitions].....	12 n/a
1771	Aggradational shoreline—Identity and existence certain, location accurate.....	A-15-1 15.5
1772	Aggradational shoreline—Identity and existence certain, location approximate.....	A-15-1 15.7
1773	Aggradational shoreline—Identity or existence questionable, location accurate.....	A-15-1 15.6
1774	Aggradational shoreline—Identity or existence questionable, location approximate.....	A-15-1 15.8
1775	Airburst spot.....	A-25-6 25.128
1776	Alabama [state location map].....	A-34-1 Sec. 34.1
1777	Alaska [state location map].....	A-34-1 Sec. 34.1
1778	Alaska borough boundary.....	A-29-1 29.3
1779	Algae.....	A-10-1 10.2.35
1780	Aligned-object lineation.....	A-9-2 Sec. 9
1781	Alluvial features.....	A-12-1 Sec. 12
1782	Altered rock (1st option).....	A-19-1 19.1.14
1783	Altered rock (2nd option).....	A-19-1 19.1.15

	<i>Page</i>	<i>Ref. No.</i>
1784		
1785	Altered rock, showing high level of mineralization..... A-19-1	19.1.16
1786	Altered rock, showing low level of mineralization A-19-1	19.1.17
1787	Ammonoids..... A-10-1	10.2.20
1788	Amphibians..... A-10-1	10.2.27
1789	Ancient convergent plate boundary—Accurately located..... A-22-1	22.13
1790	Ancient convergent plate boundary—Approximately located..... A-22-1	22.14
1791	Ancient mid-oceanic ridge—Accurately located..... A-22-1	22.5
1792	Ancient mid-oceanic ridge—Approximately located..... A-22-1	22.6
1793	Ancient spreading axis—Accurately located A-22-1	22.5
1794	Ancient spreading axis—Approximately located A-22-1	22.6
1795	Ancient transform fault, sense of offset unspecified—Accurately located A-22-1	22.23
1796	Ancient transform fault, sense of offset unspecified—Approximately located A-22-1	22.24
1797	Angle of tilt of landslide surface A-17-3	17.53
1798	Angular unconformity, planetary..... A-25-3	25.60
1799	Angular unconformity, planetary—Uncertain..... A-25-3	25.61
1800	Annelids..... A-10-1	10.2.3
1801	Annotation [concepts and definitions] 11	n/a
1802	Anticlinal buckle fold on landslide..... A-17-2	17.40
1803	Anticlinal bulge on landslide..... A-17-2	17.40
1804	Anticlinal linear ridge on landslide..... A-17-2	17.40
1805	Anticlinal soft-sediment fold on landslide A-17-2	17.40
1806	Anticline (1st option)—Identity and existence certain, location accurate A-5-1	5.1.1
1807	Anticline (1st option)—Identity and existence certain, location approximate A-5-1	5.1.3
1808	Anticline (1st option)—Identity and existence certain, location concealed A-5-1	5.1.7
1809	Anticline (1st option)—Identity and existence certain, location inferred..... A-5-1	5.1.5
1810	Anticline (1st option)—Identity or existence questionable, location accurate A-5-1	5.1.2
1811	Anticline (1st option)—Identity or existence questionable, location approximate A-5-1	5.1.4
1812	Anticline (1st option)—Identity or existence questionable, location concealed A-5-1	5.1.8
1813	Anticline (1st option)—Identity or existence questionable, location inferred..... A-5-1	5.1.6
1814	Anticline (2nd option)—Identity and existence certain, location accurate A-5-1	5.1.9
1815	Anticline (2nd option)—Identity and existence certain, location approximate A-5-1	5.1.11
1816	Anticline (2nd option)—Identity and existence certain, location concealed A-5-1	5.1.15
1817	Anticline (2nd option)—Identity and existence certain, location inferred..... A-5-1	5.1.13
1818	Anticline (2nd option)—Identity or existence questionable, location accurate A-5-1	5.1.10
1819	Anticline (2nd option)—Identity or existence questionable, location approximate A-5-1	5.1.12
1820	Anticline (2nd option)—Identity or existence questionable, location concealed A-5-1	5.1.16
1821	Anticline (2nd option)—Identity or existence questionable, location inferred..... A-5-1	5.1.14
1822	Anticlines A-5-1	Sec. 5.1
1823	Antiform (1st option)—Identity and existence certain, location accurate A-5-2	5.2.1
1824	Antiform (1st option)—Identity and existence certain, location approximate A-5-2	5.2.3

	<i>Page</i>	<i>Ref. No.</i>
1825		
1826 Antiform (1st option)—Identity and existence certain, location concealed	A-5-2	5.2.7
1827 Antiform (1st option)—Identity and existence certain, location inferred.....	A-5-2	5.2.5
1828 Antiform (1st option)—Identity or existence questionable, location accurate	A-5-2	5.2.2
1829 Antiform (1st option)—Identity or existence questionable, location approximate	A-5-2	5.2.4
1830 Antiform (1st option)—Identity or existence questionable, location concealed	A-5-2	5.2.8
1831 Antiform (1st option)—Identity or existence questionable, location inferred.....	A-5-2	5.2.6
1832 Antiform (2nd option)—Identity and existence certain, location accurate	A-5-2	5.2.9
1833 Antiform (2nd option)—Identity and existence certain, location approximate	A-5-2	5.2.11
1834 Antiform (2nd option)—Identity and existence certain, location concealed	A-5-2	5.2.15
1835 Antiform (2nd option)—Identity and existence certain, location inferred.....	A-5-2	5.2.13
1836 Antiform (2nd option)—Identity or existence questionable, location accurate	A-5-2	5.2.10
1837 Antiform (2nd option)—Identity or existence questionable, location approximate	A-5-2	5.2.12
1838 Antiform (2nd option)—Identity or existence questionable, location concealed	A-5-2	5.2.16
1839 Antiform (2nd option)—Identity or existence questionable, location inferred.....	A-5-2	5.2.14
1840 Antiformal sheath fold (1st option)—Identity and existence certain, location accurate	A-5-5	5.4.1
1841 Antiformal sheath fold (1st option)—Identity and existence certain, location approximate	A-5-5	5.4.3
1842 Antiformal sheath fold (1st option)—Identity and existence certain, location concealed	A-5-5	5.4.7
1843 Antiformal sheath fold (1st option)—Identity and existence certain, location inferred.....	A-5-5	5.4.5
1844 Antiformal sheath fold (1st option)—Identity or existence questionable, location accurate	A-5-5	5.4.2
1845 Antiformal sheath fold (1st option)—Identity or existence questionable, location approximate	A-5-5	5.4.4
1846 Antiformal sheath fold (1st option)—Identity or existence questionable, location concealed	A-5-5	5.4.8
1847 Antiformal sheath fold (1st option)—Identity or existence questionable, location inferred.....	A-5-5	5.4.6
1848 Antiformal sheath fold (2nd option)—Identity and existence certain, location accurate	A-5-5	5.4.9
1849 Antiformal sheath fold (2nd option)—Identity and existence certain, location approximate	A-5-5	5.4.11
1850 Antiformal sheath fold (2nd option)—Identity and existence certain, location concealed	A-5-5	5.4.15
1851 Antiformal sheath fold (2nd option)—Identity and existence certain, location inferred.....	A-5-5	5.4.13
1852 Antiformal sheath fold (2nd option)—Identity or existence questionable, location accurate	A-5-5	5.4.10
1853 Antiformal sheath fold (2nd option)—Identity or existence questionable, location approximate	A-5-5	5.4.12
1854 Antiformal sheath fold (2nd option)—Identity or existence questionable, location concealed	A-5-5	5.4.16
1855 Antiformal sheath fold (2nd option)—Identity or existence questionable, location inferred.....	A-5-5	5.4.14
1856 Antiformal sheath folds.....	A-5-5	Sec. 5.4
1857 Antiforms	A-5-2	Sec. 5.2
1858 Apical fissure, planetary (mapped to scale)	A-25-4	25.83
1859 Applicability [of this standard]	2	n/a
1860 Approximate mean low water line	A-30-5	30.2.31
1861 Approximate orientation of inclined bedding.....	A-6-2	6.33
1862 Approximate orientation of inclined bedding, where top direction of beds is known		
1863 from local features.....	A-6-2	6.36
1864 Approximate orientation of overturned bedding	A-6-2	6.35
1865		

	<i>Page</i>	<i>Ref. No.</i>
1866		
1867	Approximate orientation of overturned bedding, where top direction of beds is known from local	
1868	features.....	A-6-2 6.38
1869	Approximate orientation of vertical or near-vertical bedding	A-6-2 6.34
1870	Approximate orientation of vertical or near-vertical bedding, where top direction of beds is known	
1871	from local features.....	A-6-2 6.37
1872	Approximate plunge direction of inclined generic (origin or type not known or not specified)	
1873	lineation or linear structure (1st option)	A-9-1 9.1
1874	Approximate plunge direction of inclined generic (origin or type not known or not specified)	
1875	lineation or linear structure (2nd option)	A-9-1 9.2
1876	Approximately located adit (1st option).....	A-19-3 19.3.10
1877	Approximately located adit (2nd option).....	A-19-3 19.3.15
1878	Approximately located portal	A-19-3 19.3.20
1879	Approximately located tunnel entrance (1st option).....	A-19-3 19.3.10
1880	Approximately located tunnel entrance (2nd option).....	A-19-3 19.3.15
1881	Aqueduct (double-line drainage)	A-30-4 30.2.17
1882	Aqueduct (single-line drainage)	A-30-4 30.2.16
1883	Arachnids	A-10-1 10.2.5
1884	ArcGIS implementation [of this standard]	5 n/a
1885	Archean [geologic age symbol].....	A-32-2 32.30
1886	Arcuate fracture, planetary	A-25-2 25.31
1887	Area considered to have mineral resource potential but not evaluated.....	A-19-1 19.1.22
1888	Area of channelized erosion and scouring, planetary.....	A-25-3 25.69
1889	Area of clinkered coal bed.....	A-1-4 1.2.41
1890	Area of clinkered coal bed showing name	A-1-6 1.4.17
1891	Area of eolian transport, planetary	A-25-3 25.70
1892	Area of high mineral resource potential	A-19-1 19.1.19
1893	Area of identified resources.....	A-19-1 19.1.18
1894	Area of low mineral resource potential.....	A-19-1 19.1.21
1895	Area of moderate mineral resource potential	A-19-1 19.1.20
1896	Area of outcrop (1st option).....	A-31-1 31.16
1897	Area of outcrop (2nd option).....	A-31-1 31.18
1898	Area of outcrop (3rd option)	A-31-1 31.19
1899	Area of outcrop (4th option)	A-31-1 31.13
1900	Area of outcrop in surficial deposits (1st option)	A-31-1 31.14
1901	Area of outcrop in surficial deposits (2nd option)	A-31-1 31.15
1902	Area of outcrop in surficial deposits (3rd option).....	A-31-1 31.20
1903	Area of reticulate grooves, planetary	A-25-6 25.125
1904	Area of slip surface of landslide.....	A-17-1 17.9
1905	Area to be submerged behind dam	A-30-5 30.2.38
1906	Areas in geologic map databases [concepts and definitions]	11 n/a

	<i>Page</i>	<i>Ref. No.</i>
1907		
1908	Areas of extensively disturbed ground..... A-19-2	Sec. 19.2
1909	Areas on geologic maps [concepts and definitions]..... 10	n/a
1910	Arête..... A-13-2	13.42
1911	Argillaceous dolomite..... A-37-2	647
1912	Argillaceous dolostone..... A-37-2	647
1913	Argillaceous limestone..... A-37-1	638
1914	Argillaceous sandstone A-37-1	612
1915	Arial [font]..... 38	n/a
1916	Arizona [state location map] A-34-1	Sec. 34.1
1917	Arkansas [state location map]..... A-34-1	Sec. 34.1
1918	Arthropods..... A-10-1	10.2.4
1919	Artificial fill consisting of earth materials A-19-2	19.2.4
1920	Artificial fill consisting of human-generated refuse (landfill)..... A-19-2	19.2.5
1921	Asymmetric anticline (1st option)—Identity and existence certain, location accurate..... A-5-3	5.3.1
1922	Asymmetric anticline (1st option)—Identity and existence certain, location approximate..... A-5-3	5.3.3
1923	Asymmetric anticline (1st option)—Identity and existence certain, location concealed..... A-5-3	5.3.7
1924	Asymmetric anticline (1st option)—Identity and existence certain, location inferred A-5-3	5.3.5
1925	Asymmetric anticline (1st option)—Identity or existence questionable, location accurate A-5-3	5.3.2
1926	Asymmetric anticline (1st option)—Identity or existence questionable, location approximate A-5-3	5.3.4
1927	Asymmetric anticline (1st option)—Identity or existence questionable, location concealed A-5-3	5.3.8
1928	Asymmetric anticline (1st option)—Identity or existence questionable, location inferred A-5-3	5.3.6
1929	Asymmetric anticline (2nd option)—Identity and existence certain, location accurate..... A-5-3	5.3.9
1930	Asymmetric anticline (2nd option)—Identity and existence certain, location approximate..... A-5-3	5.3.11
1931	Asymmetric anticline (2nd option)—Identity and existence certain, location concealed..... A-5-3	5.3.15
1932	Asymmetric anticline (2nd option)—Identity and existence certain, location inferred A-5-3	5.3.13
1933	Asymmetric anticline (2nd option)—Identity or existence questionable, location accurate A-5-3	5.3.10
1934	Asymmetric anticline (2nd option)—Identity or existence questionable, location approximate A-5-3	5.3.12
1935	Asymmetric anticline (2nd option)—Identity or existence questionable, location concealed A-5-3	5.3.16
1936	Asymmetric anticline (2nd option)—Identity or existence questionable, location inferred..... A-5-3	5.3.14
1937	Asymmetric anticlines A-5-3	Sec. 5.3
1938	Asymmetric syncline (1st option)—Identity and existence certain, location accurate..... A-5-8	5.7.1
1939	Asymmetric syncline (1st option)—Identity and existence certain, location approximate..... A-5-8	5.7.3
1940	Asymmetric syncline (1st option)—Identity and existence certain, location concealed..... A-5-8	5.7.7
1941	Asymmetric syncline (1st option)—Identity and existence certain, location inferred A-5-8	5.7.5
1942	Asymmetric syncline (1st option)—Identity or existence questionable, location accurate..... A-5-8	5.7.2
1943	Asymmetric syncline (1st option)—Identity or existence questionable, location approximate..... A-5-8	5.7.4
1944	Asymmetric syncline (1st option)—Identity or existence questionable, location concealed..... A-5-8	5.7.8
1945	Asymmetric syncline (1st option)—Identity or existence questionable, location inferred A-5-8	5.7.6
1946	Asymmetric syncline (2nd option)—Identity and existence certain, location accurate A-5-8	5.7.9
1947	Asymmetric syncline (2nd option)—Identity and existence certain, location approximate..... A-5-8	5.7.11

	<i>Page</i>	<i>Ref. No.</i>
1948		
1949	Asymmetric syncline (2nd option)—Identity and existence certain, location concealed.....	A-5-8 5.7.15
1950	Asymmetric syncline (2nd option)—Identity and existence certain, location inferred.....	A-5-8 5.7.13
1951	Asymmetric syncline (2nd option)—Identity or existence questionable, location accurate.....	A-5-8 5.7.10
1952	Asymmetric syncline (2nd option)—Identity or existence questionable, location approximate.....	A-5-8 5.7.12
1953	Asymmetric syncline (2nd option)—Identity or existence questionable, location concealed.....	A-5-8 5.7.16
1954	Asymmetric syncline (2nd option)—Identity or existence questionable, location inferred.....	A-5-8 5.7.14
1955	Asymmetric synclines.....	A-5-8 Sec. 5.7
1956	Attributes [concepts and definitions].....	11 n/a
1957	Axial plane [concepts and definitions].....	17 n/a
1958	Axial surface [concepts and definitions].....	17 n/a
1959		
1960	B [abbreviation].....	A-v Table 2
1961	Background [of this standard].....	5 n/a
1962	Banded igneous rock.....	A-37-3 720
1963	Bar—Identity and existence certain, location accurate.....	A-15-2 15.26
1964	Bar—Identity and existence certain, location approximate.....	A-15-2 15.28
1965	Bar—Identity or existence questionable, location accurate.....	A-15-2 15.27
1966	Bar—Identity or existence questionable, location approximate.....	A-15-2 15.29
1967	Bar scale calculations.....	A-35-6 Sec. 35
1968	Bar scales.....	A-35-1 Sec. 35
1969	Barrio boundary.....	A-29-1 29.4
1970	Basal scarp, planetary.....	A-25-4 25.73
1971	Basalt-filled lava pond.....	A-18-3 18.54
1972	Basaltic flows.....	A-37-3 717
1973	Base of scarp, planetary.....	A-25-4 25.74
1974	Basin ring, planetary.....	A-25-5 25.100
1975	Basin (small, minor).....	A-5-14 5.11.3
1976	Basin structure on landslide.....	A-17-2 17.43
1977	Basins.....	A-22-2 Sec. 22
1978	Bathymetric contours.....	A-30-2 Sec. 30.1
1979	Bathymetric depression contours, showing hachure spacing for closed contours between 12.7 mm	
1980	and 76.2 mm in circumference.....	A-30-2 30.1.43
1981	Bathymetric depression contours, showing hachure spacing for closed contours less than 12.7 mm	
1982	in circumference.....	A-30-2 30.1.42
1983	Bathymetric depression contours, showing hachure spacing for closed contours more than 76.2 mm	
1984	in circumference.....	A-30-2 30.1.44
1985	Bathymetric rise contour (inside depression), showing hachure spacing for closed contours between	
1986	12.7 mm and 76.2 mm in circumference.....	A-30-2 30.1.43
1987	Bathymetric rise contour (inside depression), showing hachure spacing for closed contours less	
1988	than 12.7 mm in circumference.....	A-30-2 30.1.41

	<i>Page</i>	<i>Ref. No.</i>
1989		
1990	Bathymetric rise contour (inside depression), showing hachure spacing for closed contours more	
1991	than 76.2 mm in circumference..... A-30-2	30.1.44
1992	Beach..... A-15-1	15.1
1993	Beach ridges..... A-15-1	15.2
1994	Bearing [concepts and definitions]..... 19	n/a
1995	Bed of economically important commodity—Identity and existence certain, location accurate A-1-3	1.2.17
1996	Bed of economically important commodity—Identity and existence certain, location	
1997	approximate A-1-3	1.2.19
1998	Bed of economically important commodity—Identity and existence certain, location concealed A-1-3	1.2.23
1999	Bed of economically important commodity—Identity and existence certain, location inferred..... A-1-3	1.2.21
2000	Bed of economically important commodity—Identity or existence questionable, location	
2001	accurate A-1-3	1.2.18
2002	Bed of economically important commodity—Identity or existence questionable, location	
2003	approximate A-1-3	1.2.20
2004	Bed of economically important commodity—Identity or existence questionable, location	
2005	concealed A-1-3	1.2.24
2006	Bed of economically important commodity—Identity or existence questionable, location	
2007	inferred..... A-1-3	1.2.22
2008	Bed of economically important commodity outcrop area (1st option) A-1-4	1.2.42
2009	Bed of economically important commodity outcrop area (2nd option) A-1-4	1.2.43
2010	Bed of economically important commodity showing name A-1-6	1.4.14
2011	Bedded chert (1st option)..... A-37-2	649
2012	Bedded chert (2nd option)..... A-37-2	650
2013	Bedded sand..... A-37-1	608
2014	Bedded sandstone..... A-37-1	608
2015	Bedding A-6-1	Sec. 6
2016	Bedding overturned more than 180 degrees A-6-1	6.5
2017	Bedding overturned more than 180 degrees (dip direction to left), for multiple observations at one	
2018	locality A-6-1	6.12
2019	Bedding overturned more than 180 degrees (dip direction to left), where top direction of beds is	
2020	known from local features, for multiple observations at one locality A-6-1	6.24
2021	Bedding overturned more than 180 degrees (dip direction to right), for multiple observations at	
2022	one locality A-6-1	6.11
2023	Bedding overturned more than 180 degrees (dip direction to right), where top direction of beds is	
2024	known from local features, for multiple observations at one locality A-6-1	6.23
2025	Bedding overturned more than 180 degrees, where top direction of beds is known from local	
2026	features..... A-6-1	6.16
2027	Bedrock contour (index), as shown on hydrologic maps, showing altitude of bedrock surface—	
2028	Accurately located..... A-26-7	26.5.5
2029	Bedrock contour (index), as shown on hydrologic maps, showing altitude of bedrock surface—	
2030	Approximately located..... A-26-7	26.5.6

	<i>Page</i>	<i>Ref. No.</i>
2031		
2032	Bedrock contour (intermediate), as shown on hydrologic maps, showing altitude of bedrock	
2033	surface—Accurately located	A-26-7 26.5.7
2034	Bedrock contour (intermediate), as shown on hydrologic maps, showing altitude of bedrock	
2035	surface—Approximately located	A-26-7 26.5.8
2036	Belemnoids	A-10-1 10.2.21
2037	Benthonic foraminifera	A-10-1 10.2.50
2038	Bentonite	A-37-2 662
2039	Block-glide landslide, consisting of a relatively intact mass of displaced materials	A-17-3 17.62
2040	Blowout rim around closed depression of eolian origin in bedrock—Accurately located	A-16-1 16.4
2041	Blowout rim around closed depression of eolian origin in bedrock—Approximately located	A-16-1 16.5
2042	Blowout rim around closed depression of eolian origin in dune field	A-16-1 16.3
2043	Bog	A-30-5 30.2.46
2044	Bony coal	A-37-2 659
2045	Borrow pit, as shown on topographic maps or on general-purpose or smaller scale maps	A-30-6 30.3.2
2046	Bottom of mine shaft (drawn to scale), as shown on subsurface exploration maps	A-19-5 19.4.5
2047	Boudins	A-9-3 Sec. 9
2048	Boundaries	A-29-1 Sec. 29
2049	Boundaries located by geophysical methods	A-3-1 Sec. 3.1
2050	Boundary—Alaska borough	A-29-1 29.3
2051	Boundary—Barrio	A-29-1 29.4
2052	Boundary—City	A-29-1 29.5
2053	Boundary—Civil township	A-29-1 29.4
2054	Boundary—County	A-29-1 29.3
2055	Boundary—District	A-29-1 29.4
2056	Boundary—Forest Reserve	A-29-1 29.6
2057	Boundary—Hawaii Homestead	A-29-1 29.6
2058	Boundary—Incorporated borough	A-29-1 29.5
2059	Boundary—Incorporated city	A-29-1 29.5
2060	Boundary—Incorporated hamlet	A-29-1 29.5
2061	Boundary—Incorporated town	A-29-1 29.5
2062	Boundary—Incorporated village	A-29-1 29.5
2063	Boundary—Judicial division	A-29-1 29.3
2064	Boundary—Municipio	A-29-1 29.3
2065	Boundary—National	A-29-1 29.1
2066	Boundary—National forest	A-29-1 29.6
2067	Boundary—National grassland	A-29-1 29.6
2068	Boundary—National monument	A-29-1 29.6
2069	Boundary—National park	A-29-1 29.6
2070	Boundary—National reservation	A-29-1 29.6
2071	Boundary—National wilderness area	A-29-1 29.6

	<i>Page</i>	<i>Ref. No.</i>
2072		
2073	Boundary—National wildlife refuge.....	A-29-1 29.6
2074	Boundary—Parish.....	A-29-1 29.3
2075	Boundary—Park (small).....	A-29-1 29.7
2076	Boundary—Precinct.....	A-29-1 29.4
2077	Boundary—Small park.....	A-29-1 29.7
2078	Boundary—State.....	A-29-1 29.2
2079	Boundary—State forest.....	A-29-1 29.6
2080	Boundary—State grassland.....	A-29-1 29.6
2081	Boundary—State monument.....	A-29-1 29.6
2082	Boundary—State park.....	A-29-1 29.6
2083	Boundary—State reservation.....	A-29-1 29.6
2084	Boundary—State wilderness area.....	A-29-1 29.6
2085	Boundary—State wildlife refuge.....	A-29-1 29.6
2086	Boundary—Territory.....	A-29-1 29.2
2087	Boundary—Town.....	A-29-1 29.4
2088	Boundary—Township.....	A-29-1 29.4
2089	Boundary located by aeromagnetic survey.....	A-3-1 3.1.1
2090	Boundary located by electromagnetic survey.....	A-3-1 3.1.7
2091	Boundary located by gravity survey.....	A-3-1 3.1.3
2092	Boundary located by ground magnetic survey.....	A-3-1 3.1.2
2093	Boundary located by induced polarization survey.....	A-3-1 3.1.6
2094	Boundary located by magnetotelluric survey.....	A-3-1 3.1.9
2095	Boundary located by radiometric survey.....	A-3-1 3.1.4
2096	Boundary located by resistivity survey.....	A-3-1 3.1.8
2097	Boundary located by seismic reflection survey.....	A-3-1 3.1.5
2098	Brachiopods.....	A-10-1 10.2.9
2099	Braided creek.....	A-30-4 30.2.6
2100	Braided river.....	A-30-4 30.2.6
2101	Braided stream.....	A-30-4 30.2.6
2102	Breccia (1st option).....	A-37-1 605
2103	Breccia (2nd option).....	A-37-1 606
2104	Breccia pipe.....	A-18-3 18.70
2105	Broad ridge crest, planetary (generally associated with coronae).....	A-25-2 25.40
2106	Broad warp, planetary.....	A-25-2 25.36
2107	Broken rock around fault.....	A-2-16 2.14.4
2108	Broken rock within fault.....	A-2-16 2.14.3
2109	Brown [spot color].....	A-v Table 3
2110	Bryozoans.....	A-10-1 10.2.10
2111	Bulge on landslide.....	A-17-2 17.41
2112	Buried impact crater rim, planetary.....	A-25-5 25.98

	<i>Page</i>	<i>Ref. No.</i>
2113		
2114	Buried volcanic fissure..... A-18-2	18.42
2115	Burrows A-10-1	10.2.42
2116		
2117	C [abbreviation]..... A-v	Table 2
2118	Calcareous sandstone A-37-1	613
2119	Calcareous shale A-37-1	623
2120	Calcareous siltstone A-37-1	617
2121	Caldera margin (1st option)—Identity and existence certain, location accurate..... A-18-1	18.8
2122	Caldera margin (1st option)—Identity and existence certain, location approximate..... A-18-1	18.10
2123	Caldera margin (1st option)—Identity and existence certain, location concealed..... A-18-1	18.14
2124	Caldera margin (1st option)—Identity and existence certain, location inferred A-18-1	18.12
2125	Caldera margin (1st option)—Identity or existence questionable, location accurate..... A-18-1	18.9
2126	Caldera margin (1st option)—Identity or existence questionable, location approximate..... A-18-1	18.11
2127	Caldera margin (1st option)—Identity or existence questionable, location concealed..... A-18-1	18.15
2128	Caldera margin (1st option)—Identity or existence questionable, location inferred A-18-1	18.13
2129	Caldera margin (2nd option)—Identity and existence certain, location accurate..... A-18-1	18.16
2130	Caldera margin (2nd option)—Identity and existence certain, location approximate..... A-18-1	18.18
2131	Caldera margin (2nd option)—Identity and existence certain, location concealed..... A-18-1	18.22
2132	Caldera margin (2nd option)—Identity and existence certain, location inferred A-18-1	18.20
2133	Caldera margin (2nd option)—Identity or existence questionable, location accurate..... A-18-1	18.17
2134	Caldera margin (2nd option)—Identity or existence questionable, location approximate..... A-18-1	18.19
2135	Caldera margin (2nd option)—Identity or existence questionable, location concealed..... A-18-1	18.23
2136	Caldera margin (2nd option)—Identity or existence questionable, location inferred A-18-1	18.21
2137	Caldera, planetary A-25-5	25.111
2138	California [state location map]..... A-34-1	Sec. 34.1
2139	Cambrian [geologic age symbol]..... A-32-1	32.18
2140	Canal (double-line drainage)..... A-30-4	30.2.8
2141	Canal lock (double-line drainage)..... A-30-4	30.2.11
2142	Canal lock (single-line drainage) (1st option) A-30-4	30.2.9
2143	Canal lock (single-line drainage) (2nd option) A-30-4	30.2.10
2144	Canal (single-line drainage)..... A-30-4	30.2.7
2145	Capped water well..... A-26-1	26.1.3
2146	Carbonaceous shale A-37-1	624
2147	Carboniferous [geologic age symbol]..... A-32-1	32.12
2148	Carolina bay A-30-5	30.2.42
2149	Cartographic representation of locational accuracy [concepts and definitions]..... 32	n/a
2150	Cartographic representation of scientific confidence [concepts and definitions]..... 26	n/a
2151	Cave entrance, as shown on topographic maps or on general-purpose or smaller scale maps..... A-30-6	30.3.4
2152	Caved workings (drawn to scale), as shown on subsurface exploration maps A-19-5	19.4.11
2153	Cenozoic [geologic age symbol] A-32-1	32.1

	<i>Page</i>	<i>Ref. No.</i>
2154		
2155	Central peak of impact crater, planetary (1st option)	A-25-5 25.101
2156	Central peak of impact crater, planetary (2nd option)	A-25-5 25.102
2157	Central peak, planetary (not mapped to scale).....	A-25-4 25.82
2158	Cephalopods.....	A-10-1 10.2.19
2159	"Certain" [concepts and definitions]	22 n/a
2160	Chain craters, planetary.....	A-25-5 25.110
2161	Chalk	A-37-1 626
2162	Changes [in this standard] from previous standards	7 n/a
2163	Channel bars, planetary, may be erosional or depositional	A-25-5 25.116
2164	Channel (canali), planetary.....	A-25-3 25.56
2165	Channel (canali), planetary, where structureless or indefinite.....	A-25-3 25.57
2166	Channels in sedimentary materials.....	A-9-1 Sec. 9
2167	Chart showing conversion values from inches (in) to points (pts) to millimeters (mm).....	A-iv Table 1
2168	Cherty and sandy crossbedded clastic limestone.....	A-37-1 634
2169	Cherty crossbedded limestone	A-37-1 633
2170	Cherty dolomite.....	A-37-2 648
2171	Cherty dolostone.....	A-37-2 648
2172	Cherty limestone (1st option)	A-37-1 639
2173	Cherty limestone (2nd option)	A-37-1 640
2174	Cherty shale	A-37-1 621
2175	Chitinozoans.....	A-10-1 10.2.56
2176	Chronostratigraphic-zone boundary.....	A-31-1 31.23
2177	Chronozone boundary.....	A-31-1 31.23
2178	Cinder cone, large	A-18-3 18.56
2179	Cinder cone on small-scale maps.....	A-18-3 18.68
2180	Cinder cone, small.....	A-18-3 18.55
2181	Cirque headwall.....	A-13-2 13.41
2182	City boundary	A-29-1 29.5
2183	Civil township boundary.....	A-29-1 29.4
2184	Clastic limestone.....	A-37-1 628
2185	Clay.....	A-37-1 620
2186	Clay bed—Identity and existence certain, location accurate	A-1-3 1.2.9
2187	Clay bed—Identity and existence certain, location approximate	A-1-3 1.2.11
2188	Clay bed—Identity and existence certain, location concealed	A-1-3 1.2.15
2189	Clay bed—Identity and existence certain, location inferred.....	A-1-3 1.2.13
2190	Clay bed—Identity or existence questionable, location accurate	A-1-3 1.2.10
2191	Clay bed—Identity or existence questionable, location approximate	A-1-3 1.2.12
2192	Clay bed—Identity or existence questionable, location concealed	A-1-3 1.2.16
2193	Clay bed—Identity or existence questionable, location inferred.....	A-1-3 1.2.14
2194	Clay bed outcrop area.....	A-1-4 1.2.44

	<i>Page</i>	<i>Ref. No.</i>
2195		
2196 Clay bed showing name	A-1-6	1.4.13
2197 Clay pit.....	A-19-3	19.3.2
2198 Clay pit, as shown on topographic maps or on general-purpose or smaller scale maps.....	A-30-6	30.3.2
2199 Clay shale.....	A-37-1	620
2200 Cleavage	A-7-1	Sec. 7
2201 Cliff on shoreline	A-15-2	Sec. 15
2202 Clinkered coal bed—Identity and existence certain, location accurate.....	A-1-4	1.2.33
2203 Clinkered coal bed—Identity and existence certain, location approximate.....	A-1-4	1.2.35
2204 Clinkered coal bed—Identity and existence certain, location concealed.....	A-1-4	1.2.39
2205 Clinkered coal bed—Identity and existence certain, location inferred.....	A-1-4	1.2.37
2206 Clinkered coal bed—Identity or existence questionable, location accurate	A-1-4	1.2.34
2207 Clinkered coal bed—Identity or existence questionable, location approximate	A-1-4	1.2.36
2208 Clinkered coal bed—Identity or existence questionable, location concealed	A-1-4	1.2.40
2209 Clinkered coal bed—Identity or existence questionable, location inferred.....	A-1-4	1.2.38
2210 Clinkered coal bed area.....	A-1-4	1.2.41
2211 Clinkered coal bed showing name.....	A-1-6	1.4.16
2212 Closed depression on landslide (mapped to scale).....	A-17-3	17.49
2213 CMYK [abbreviation].....	A-v	Table 2
2214 CMYK color [equivalents of spot colors].....	A-v	Table 3
2215 CMYK Color Chart	In pocket	n/a
2216 CMYK Color Chart explanation.....	A-39-1	Sec. 39
2217 CMYK color model	A-v	Table 3
2218 CMYK colors	35	n/a
2219 Cnidarians	A-10-1	10.2.11
2220 Coal.....	A-37-2	658
2221 Coal bed—Identity and existence certain, location accurate	A-1-4	1.2.25
2222 Coal bed—Identity and existence certain, location approximate	A-1-4	1.2.27
2223 Coal bed—Identity and existence certain, location concealed	A-1-4	1.2.31
2224 Coal bed—Identity and existence certain, location inferred.....	A-1-4	1.2.29
2225 Coal bed—Identity or existence questionable, location accurate	A-1-4	1.2.26
2226 Coal bed—Identity or existence questionable, location approximate	A-1-4	1.2.28
2227 Coal bed—Identity or existence questionable, location concealed	A-1-4	1.2.32
2228 Coal bed—Identity or existence questionable, location inferred.....	A-1-4	1.2.30
2229 Coal bed outcrop area.....	A-1-4	1.2.45
2230 Coal bed showing name	A-1-6	1.4.15
2231 Collapse structure (drawn to scale).....	A-23-1	23.10
2232 Collapse structure indicating breccia pipe at depth	A-18-3	18.71
2233 Collapse structure (too small to draw to scale).....	A-23-1	23.9
2234 Collapsed lava tube, planetary	A-25-5	25.110
2235 Collapses (mapped to scale) along lava tube.....	A-18-2	18.45

	<i>Page</i>	<i>Ref. No.</i>
2236		
2237	Collection number of fossil A-10-1	10.1.1
2238	Color Chart In pocket	n/a
2239	Color conversion [during output]..... 35	n/a
2240	Color for line symbols 36	n/a
2241	Color for map-unit areas..... 35	n/a
2242	Color for point symbols..... 36	n/a
2243	Color selection guidelines 33	n/a
2244	Color specifications for line symbols [in this standard] 40	n/a
2245	Color specifications for map-unit areas [in this standard] 42	n/a
2246	Color specifications for point symbols [in this standard] 40	n/a
2247	Colorado [state location map]..... A-34-1	Sec. 34.1
2248	Complete weather station, equipped with a recorder A-27-1	27.18
2249	Complete weather station, equipped with a telephone or radio A-27-1	27.17
2250	"Concealed" [concepts and definitions] 27	n/a
2251	Concentric fracture, planetary (associated with coronae)..... A-25-2	25.34
2252	Condensate show A-19-9	19.5.72
2253	Condensate well (nonspecific depth) A-19-9	19.5.73
2254	Cone, large..... A-18-3	18.56
2255	Cone, small A-18-3	18.55
2256	Confidence in a feature's existence [concepts and definitions]..... 22	n/a
2257	Confidence in a feature's identity [concepts and definitions]..... 22	n/a
2258	Confidence in a feature's locatability [concepts and definitions] 27	n/a
2259	Confidence in a feature's positioning [concepts and definitions] 29	n/a
2260	Conglomerate (1st option)..... A-37-1	601
2261	Conglomerate (2nd option)..... A-37-1	602
2262	Conifers A-10-1	10.2.36
2263	Connecticut [state location map] A-34-1	Sec. 34.1
2264	Conodonts A-10-1	10.2.46
2265	Contact—Identity and existence certain, location accurate..... A-1-1	1.1.1
2266	Contact—Identity and existence certain, location approximate..... A-1-1	1.1.3
2267	Contact—Identity and existence certain, location concealed..... A-1-1	1.1.7
2268	Contact—Identity and existence certain, location inferred A-1-1	1.1.5
2269	Contact—Identity or existence questionable, location accurate..... A-1-1	1.1.2
2270	Contact—Identity or existence questionable, location approximate..... A-1-1	1.1.4
2271	Contact—Identity or existence questionable, location concealed..... A-1-1	1.1.8
2272	Contact—Identity or existence questionable, location inferred A-1-1	1.1.6
2273	Contact line-symbol decorations A-1-6	Sec. 1.4
2274	Contact notations A-1-6	Sec. 1.4
2275	Contact, planetary—Location accurate..... A-25-1	25.1
2276	Contact, planetary—Location approximate..... A-25-1	25.2

	<i>Page</i>	<i>Ref. No.</i>
2277		
2278	Contact, planetary—Location concealed..... A-25-1	25.4
2279	Contact, planetary—Location inferred A-25-1	25.3
2280	Contact separating individual lava flows within same map unit—Identity and existence certain,	
2281	location accurate..... A-18-2	18.24
2282	Contact separating individual lava flows within same map unit—Identity and existence certain,	
2283	location approximate..... A-18-2	18.26
2284	Contact separating individual lava flows within same map unit—Identity and existence certain,	
2285	location concealed..... A-18-2	18.30
2286	Contact separating individual lava flows within same map unit—Identity and existence certain,	
2287	location inferred A-18-2	18.28
2288	Contact separating individual lava flows within same map unit—Identity or existence questionable,	
2289	location accurate..... A-18-2	18.25
2290	Contact separating individual lava flows within same map unit—Identity or existence questionable,	
2291	location approximate..... A-18-2	18.27
2292	Contact separating individual lava flows within same map unit—Identity or existence questionable,	
2293	location concealed..... A-18-2	18.31
2294	Contact separating individual lava flows within same map unit—Identity or existence questionable,	
2295	location inferred A-18-2	18.29
2296	Contact showing location where contact is particularly well exposed in field..... A-1-6	1.4.10
2297	Contact showing relative age of intrusive or extrusive units where known (Y, younger; O, older)..... A-1-6	1.4.9
2298	Contact showing thickness of bed of economically important commodity and location where	
2299	thickness was measured..... A-1-6	1.4.11
2300	Contact showing thickness of clay bed and location where thickness was measured..... A-1-6	1.4.11
2301	Contact showing thickness of coal bed and location where thickness was measured..... A-1-6	1.4.11
2302	Contact showing thickness of dike and location where thickness was measured..... A-1-6	1.4.11
2303	Contact showing thickness of key bed and location where thickness was measured..... A-1-6	1.4.11
2304	Contacts..... A-1-1	Sec. 1.1
2305	Contacts [concepts and definitions]..... 13	n/a
2306	Contacts, volcanic A-18-2	Sec. 18
2307	Conterminous states [location map]..... A-34-3	Sec. 34.2
2308	Continental Divide A-29-1	29.8
2309	Continental slope—Accurately located..... A-22-2	22.25
2310	Continental slope—Approximately located..... A-22-2	22.26
2311	Continental slope, showing margin filled by sedimentation..... A-22-2	22.27
2312	Continuous cleavage A-7-1	Sec. 7
2313	Continuous foliation..... A-8-3	Sec. 8.3
2314	Continuous-record low-flow measurement water gaging station A-26-5	26.3.6
2315	Continuous-record peak-flow measurement water gaging station A-26-5	26.3.5
2316	Continuous-record stage-measurement water gaging station..... A-26-5	26.3.7
2317	Continuous-record water gaging station..... A-26-5	26.3.3

	<i>Page</i>	<i>Ref. No.</i>
2318		
2319	Continuous-record water gaging station, equipped with a telephone or radio.....	A-26-5 26.3.4
2320	Contorted bedding	A-6-2 Sec. 6
2321	Contorted gneiss	A-37-3 709
2322	Contorted schist	A-37-3 706
2323	Contours, bathymetric.....	A-30-2 Sec. 30.1
2324	Contours, geohydrologic.....	A-26-7 Sec. 26.5
2325	Contours, geophysical.....	A-11-1 Sec. 11
2326	Contours, glacier.....	A-30-3 Sec. 30.1
2327	Contours, structure	A-11-1 Sec. 11
2328	Contours, topographic.....	A-30-1 Sec. 30.1
2329	Contrast [influencing color and pattern selection]	35 n/a
2330	Convergent plate boundaries.....	A-22-1 Sec. 22
2331	Conversion values from inches (in) to points (pts) to millimeters (mm).....	A-iv Table 1
2332	Coprolites.....	A-10-1 10.2.43
2333	Coral reef	A-30-6 30.3.18
2334	Corals.....	A-10-1 10.2.12
2335	Core (nonspecific depth).....	A-19-6 19.5.7
2336	Corona annulus ridge, planetary, showing axial trace and plunge	A-25-2 25.46
2337	Corona, planetary	A-25-4 25.91
2338	County boundary	A-29-1 29.3
2339	Covered water storage reservoir.....	A-30-5 30.2.40
2340	Cracks formed in ground by earthquake.....	A-21-2 21.36
2341	Cracks on landslides.....	A-17-2 Sec. 17
2342	Cracks on surface of lava flow.....	A-18-2 18.40
2343	Crater-associated ejecta halo, planetary	A-25-6 25.134
2344	Crater outline, unspecified origin.....	A-23-1 23.11
2345	Crater, volcanic—Identity and existence certain, location accurate	A-18-1 18.1
2346	Crater, volcanic—Identity and existence certain, location concealed	A-18-1 18.5
2347	Crater, volcanic—Identity or existence certain, location approximate.....	A-18-1 18.3
2348	Crater, volcanic—Identity or existence questionable, location accurate.....	A-18-1 18.2
2349	Crater, volcanic—Identity or existence questionable, location approximate.....	A-18-1 18.4
2350	Crater, volcanic—Identity or existence questionable, location concealed.....	A-18-1 18.6
2351	Crater with rim, formed by shock or sand blowouts—Identity and existence certain, location	
2352	accurate	A-21-2 21.24
2353	Crater with rim, formed by shock or sand blowouts—Identity and existence certain, location	
2354	concealed	A-21-2 21.28
2355	Crater with rim, formed by shock or sand blowouts—Identity or existence certain, location	
2356	approximate	A-21-2 21.26
2357	Crater with rim, formed by shock or sand blowouts—Identity or existence questionable, location	
2358	accurate	A-21-2 21.25

	<i>Page</i>	<i>Ref. No.</i>
2359		
2360	Crater with rim, formed by shock or sand blowouts—Identity or existence questionable, location	
2361	approximate	A-21-2 21.27
2362	Crater with rim, formed by shock or sand blowouts—Identity or existence questionable, location	
2363	concealed	A-21-2 21.29
2364	Crater without rim, formed by shock—Identity and existence certain, location accurate	A-21-2 21.30
2365	Crater without rim, formed by shock—Identity or existence certain, location approximate	A-21-2 21.32
2366	Crater without rim, formed by shock—Identity or existence certain, location concealed	A-21-2 21.34
2367	Crater without rim, formed by shock—Identity or existence questionable, location accurate	A-21-2 21.31
2368	Crater without rim, formed by shock—Identity or existence questionable, location approximate	A-21-2 21.33
2369	Crater without rim, formed by shock—Identity or existence questionable, location concealed	A-21-2 21.35
2370	Creeks	A-30-4 Sec. 30.2
2371	Crenulated bedding	A-6-2 Sec. 6
2372	Crenulation cleavage	A-7-1 Sec. 7
2373	Crenulation foliation	A-8-4 Sec. 8.3
2374	Crenulation lineation	A-9-6 Sec. 9
2375	Crest line [concepts and definitions]	17 n/a
2376	Crest line of asymmetrical moraine	A-13-1 13.13
2377	Crest line of fold	A-5-13 5.10.10
2378	Crest line of lateral levee on landslide (1st option)	A-17-3 17.44
2379	Crest line of lateral levee on landslide (2nd option)	A-17-3 17.45
2380	Crest line of moraine, sense of symmetry unspecified (1st option)	A-13-1 13.10
2381	Crest line of moraine, sense of symmetry unspecified (2nd option)	A-13-1 13.11
2382	Crest line of pressure ridge or tumulus on lava flow	A-18-2 18.46
2383	Crest line of symmetrical moraine	A-13-1 13.12
2384	Cretaceous [geologic age symbol]	A-32-1 32.7
2385	Crevasse on glacier	A-13-1 13.1
2386	Cribbing along drift (drawn to scale), as shown on subsurface exploration maps	A-19-5 19.4.14
2387	Crinoids	A-10-1 10.2.15
2388	Cross section line and label	A-31-1 31.10
2389	Cross ticks showing location and orientation of data collection lines crossing geophysical	
2390	boundary	A-3-1 3.3.3
2391	Crossbedded conglomerate	A-37-1 603
2392	Crossbedded dolomite	A-37-1 643
2393	Crossbedded dolostone	A-37-1 643
2394	Crossbedded gravel	A-37-1 603
2395	Crossbedded limestone	A-37-1 632
2396	Crossbedded sand (1st option)	A-37-1 609
2397	Crossbedded sand (2nd option)	A-37-1 610
2398	Crossbedded sandstone (1st option)	A-37-1 609
2399	Crossbedded sandstone (2nd option)	A-37-1 610

	<i>Page</i>	<i>Ref. No.</i>
2400		
2401	Crossbedded subgraywacke A-37-2	655
2402	Crosscut tunnel (drawn to scale), as shown on subsurface exploration maps A-19-5	19.4.9
2403	Crustaceans A-10-1	10.2.6
2404	Crystal tuff A-37-3	712
2405	Cumulate foliation A-8-1	Sec. 8.2
2406	Cutbanks of glacial meltwater stream channel (mapped to scale) A-13-1	13.8
2407		
2408	Dammed reservoir A-30-5	30.2.37
2409	Dark-colored ejecta, planetary A-25-6	25.118
2410	Dark-colored mantling material, planetary A-25-6	25.121
2411	Dashed line symbol [concepts and definitions] 32	n/a
2412	Databases [concepts and definitions] 11	n/a
2413	Datum for geophysical contours A-11-1	11.2
2414	Datum for structure contours, 1st surface A-11-1	11.14
2415	Datum for structure contours, 2nd surface A-11-2	11.24
2416	Datum for structure contours, 3rd surface A-11-2	11.34
2417	Debris slide, consisting of a loose and relatively shallow veneer of displaced materials A-17-3	17.64
2418	Debris-slide slope (mapped to scale), consisting of coalesced scars of landslides and debris flows	
2419	that are too small or numerous to be shown at map scale A-17-3	17.65
2420	Declination arrows A-36-1	Sec. 36
2421	Deep condensate well A-19-9	19.5.79
2422	Deep core A-19-6	19.5.9
2423	Deep disposal well A-19-7	19.5.30
2424	Deep dry hole A-19-7	19.5.22
2425	Deep gas and condensate well A-19-10	19.5.89
2426	Deep gas storage well A-19-10	19.5.96
2427	Deep gas well A-19-8	19.5.57
2428	Deep gas well, plugged back and producing shallow gas A-19-8	19.5.60
2429	Deep junked hole A-19-7	19.5.25
2430	Deep observation well for gas-storage field A-19-10	19.5.102
2431	Deep oil and gas well A-19-9	19.5.69
2432	Deep oil well A-19-8	19.5.46
2433	Deep salt-water disposal well A-19-7	19.5.36
2434	Deep-sea trench A-22-2	22.30
2435	Deep-seismofocal zones A-22-1	Sec. 22
2436	Degraded impact crater rim, planetary (1st option) A-25-5	25.97
2437	Degraded impact crater rim, planetary (2nd option) A-25-5	25.98
2438	Delaware [state location map] A-34-1	Sec. 34.1
2439	Depression (mapped to scale), planetary A-25-3	25.53
2440	Depression on landslide A-17-2	17.43

	<i>Page</i>	<i>Ref. No.</i>
2441		
2442 Destroyed adit (1st option)	A-19-3	19.3.11
2443 Destroyed adit (2nd option)	A-19-3	19.3.16
2444 Destroyed portal	A-19-3	19.3.21
2445 Destroyed tunnel entrance (1st option)	A-19-3	19.3.11
2446 Destroyed tunnel entrance (2nd option)	A-19-3	19.3.16
2447 Destroyed well, once used for domestic-water supply	A-26-1	26.1.14
2448 Destroyed well, once used for industrial-water supply	A-26-2	26.1.41
2449 Destroyed well, once used for irrigation-water supply	A-26-2	26.1.32
2450 Destroyed well, once used for public-water supply	A-26-3	26.1.50
2451 Destroyed well, once used for stock-water supply	A-26-1	26.1.23
2452 Detached lobe, planetary	A-25-6	25.126
2453 Detachment fault, movement of upper plate to left (in cross section)	A-2-11	2.11.18
2454 Detachment fault, movement of upper plate to right (in cross section)	A-2-11	2.11.19
2455 Detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location		
2456 accurate	A-2-9	2.10.1
2457 Detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location		
2458 approximate	A-2-9	2.10.3
2459 Detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location		
2460 concealed	A-2-9	2.10.7
2461 Detachment fault (sense of slip unspecified) (1st option)—Identity and existence certain, location		
2462 inferred	A-2-9	2.10.5
2463 Detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable,		
2464 location accurate	A-2-9	2.10.2
2465 Detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable,		
2466 location approximate	A-2-9	2.10.4
2467 Detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable,		
2468 location concealed	A-2-9	2.10.8
2469 Detachment fault (sense of slip unspecified) (1st option)—Identity or existence questionable,		
2470 location inferred	A-2-9	2.10.6
2471 Detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location		
2472 accurate	A-2-9	2.10.9
2473 Detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location		
2474 approximate	A-2-9	2.10.11
2475 Detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location		
2476 concealed	A-2-9	2.10.15
2477 Detachment fault (sense of slip unspecified) (2nd option)—Identity and existence certain, location		
2478 inferred	A-2-9	2.10.13
2479 Detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable,		
2480 location accurate	A-2-9	2.10.10
2481 Detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable,		
2482 location approximate	A-2-9	2.10.12

	<i>Page</i>	<i>Ref. No.</i>
2483		
2484 Detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable,		
2485 location concealed	A-2-9	2.10.16
2486 Detachment fault (sense of slip unspecified) (2nd option)—Identity or existence questionable,		
2487 location inferred	A-2-9	2.10.14
2488 Detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location		
2489 accurate	A-2-9	2.10.17
2490 Detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location		
2491 approximate	A-2-9	2.10.19
2492 Detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location		
2493 concealed	A-2-9	2.10.23
2494 Detachment fault (sense of slip unspecified) (3rd option)—Identity and existence certain, location		
2495 inferred	A-2-9	2.10.21
2496 Detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable,		
2497 location accurate	A-2-9	2.10.18
2498 Detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable,		
2499 location approximate	A-2-9	2.10.20
2500 Detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable,		
2501 location concealed	A-2-9	2.10.24
2502 Detachment fault (sense of slip unspecified) (3rd option)—Identity or existence questionable,		
2503 location inferred	A-2-9	2.10.22
2504 Detachment faults (sense of slip unspecified)	A-2-9	Sec. 2.10
2505 Determining appropriate line symbol styles and associated terminology	25	Fig. 2
2506 Development of standard	3	n/a
2507 Devitrified tuff	A-37-3	713
2508 Devonian [geologic age symbol]	A-32-1	32.15
2509 Diagram showing relation of new FGDC standard terminology to historically used terminology		
2510 and to traditional line symbol styles	24	Fig. 1
2511 Diamicton (1st option)	A-37-2	681
2512 Diamicton (2nd option)	A-37-2	682
2513 Diamicton (3rd option)	A-37-2	683
2514 Diatomaceous rock	A-37-2	653
2515 Diatoms	A-10-1	10.2.47
2516 Diatrema	A-18-3	18.69
2517 Diffuse highland-lowland boundary scarp, planetary	A-25-6	25.123
2518 Dike (1st option)—Identity and existence certain, location accurate	A-1-5	1.3.1
2519 Dike (1st option)—Identity and existence certain, location approximate	A-1-5	1.3.2
2520 Dike (2nd option)—Identity and existence certain, location accurate	A-1-5	1.3.3
2521 Dike (2nd option)—Identity and existence certain, location approximate	A-1-5	1.3.4
2522 Dike (3rd option)—Identity and existence certain, location accurate	A-1-5	1.3.5
2523 Dike (3rd option)—Identity and existence certain, location approximate	A-1-5	1.3.6
2524 Dike (4th option)—Identity and existence certain, location accurate	A-1-5	1.3.7

	<i>Page</i>	<i>Ref. No.</i>
2525		
2526 Dike (4th option)—Identity and existence certain, location approximate	A-1-5	1.3.8
2527 Dike (5th option)—Identity and existence certain, location accurate	A-1-5	1.3.9
2528 Dike (5th option)—Identity and existence certain, location approximate	A-1-5	1.3.10
2529 Dike (6th option)—Identity and existence certain, location accurate	A-1-5	1.3.11
2530 Dike (6th option)—Identity and existence certain, location approximate	A-1-5	1.3.12
2531 Dike intruding fault (1st option).....	A-1-5	1.3.14
2532 Dike intruding fault (1st option) showing name.....	A-1-6	1.4.20
2533 Dike intruding fault (2nd option).....	A-1-5	1.3.15
2534 Dike intruding fault (2nd option) showing name.....	A-1-6	1.4.21
2535 Dike line-symbol decorations.....	A-1-6	Sec. 1.4
2536 Dike notations.....	A-1-6	Sec. 1.4
2537 Dike of variable thickness.....	A-1-5	1.3.13
2538 Dike of variable thickness showing name.....	A-1-6	1.4.19
2539 Dike showing name	A-1-6	1.4.18
2540 Dikes	A-1-5	Sec. 1.3
2541 Dinoflagellates	A-10-1	10.2.57
2542 Dip [concepts and definitions].....	18	n/a
2543 Direction of downslope movement of landslide.....	A-17-1	17.10
2544 Direction of flow of glacial meltwater in stream channel.....	A-13-1	13.9
2545 Direction of fluvial transport.....	A-12-1	12.5
2546 Direction of ground-water flow (1st option)—Accurately located	A-26-9	26.7.8
2547 Direction of ground-water flow (1st option)—Approximately located	A-26-9	26.7.9
2548 Direction of ground-water flow (2nd option)—Accurately located	A-26-9	26.7.10
2549 Direction of ground-water flow (2nd option)—Approximately located	A-26-9	26.7.11
2550 Direction of ice flow	A-13-1	13.2
2551 Direction of sediment transport, determined from crossbeds.....	A-12-1	12.7
2552 Direction of sediment transport, determined from dune bedding in horizontal section.....	A-16-1	16.8
2553 Direction of sediment transport, determined from dune forms.....	A-16-1	16.7
2554 Direction of sediment transport, determined from eolian crossbedding in vertical or near-vertical section.....	A-16-1	16.9
2556 Direction of sediment transport, determined from flute casts	A-12-1	12.8
2557 Direction of sediment transport, determined from imbrication.....	A-12-1	12.6
2558 Direction of tilt of landslide surface	A-17-3	17.52
2559 Direction of tilt of landslide surface, showing angle of tilt	A-17-3	17.53
2560 Discontinued water gaging station	A-26-5	26.3.2
2561 Discontinued weather station	A-27-1	27.2
2562 Discrete faults [concepts and definitions].....	16	n/a
2563 Discrete faults versus fault zones [concepts and definitions].....	16	n/a
2564 Disjunctive cleavage	A-7-1	Sec. 7
2565 Disjunctive foliation.....	A-8-4	Sec. 8.3

	<i>Page</i>	<i>Ref. No.</i>
2566		
2567 Displacement of fault	A-2-11	2.11.14
2568 Displacement of fault during historic time (includes areas of known fault creep).....	A-2-16	2.13.1
2569 Displacement of fault during Holocene time	A-2-16	2.13.2
2570 Displacement of fault during late Quaternary time	A-2-16	2.13.3
2571 Displacement of fault during Quaternary time (undifferentiated).....	A-2-16	2.13.4
2572 Displacement vector, showing bearing	A-17-3	17.54
2573 Displacement vector, showing bearing and distance.....	A-17-3	17.55
2574 Disposal well (nonspecific depth).....	A-19-7	19.5.26
2575 Distance specifications [in this standard].....	40	n/a
2576 District boundary	A-29-1	29.4
2577 District of Columbia [location map]	A-34-1	Sec. 34.1
2578 Disturbed ground	A-19-2	Sec. 19.2
2579 Ditch (double-line drainage)	A-30-4	30.2.8
2580 Ditch (single-line drainage)	A-30-4	30.2.7
2581 DO [abbreviation]	A-v	Table 2
2582 Dolomite	A-37-1	642
2583 Dolomitic limestone.....	A-37-1	641
2584 Dolomitic sandstone.....	A-37-1	614
2585 Dolomitic shale	A-37-1	622
2586 Dolomitic siltstone	A-37-1	618
2587 Dolostone	A-37-1	642
2588 Dome, edifice, or circular scarp, planetary (mapped to scale).....	A-25-4	25.75
2589 Dome (small, minor)	A-5-14	5.11.2
2590 Dome structure on landslide	A-17-2	17.41
2591 Dormant-mature landslide (mapped to scale), showing a smoothed and eroded morphology	A-17-3	17.60
2592 Dormant-old landslide (mapped to scale), showing a weak morphology	A-17-3	17.61
2593 Dormant-young debris flow, showing a fresh and uneroded morphology but having no evidence of		
2594 historic activity.....	A-17-3	17.57
2595 Dormant-young landslide (mapped to scale), showing a fresh and uneroded morphology but having		
2596 no evidence of historic activity	A-17-3	17.59
2597 Dotted line symbol [concepts and definitions]	33	n/a
2598 Doubly plunging anticline	A-5-13	5.10.6
2599 Doubly plunging syncline	A-5-13	5.10.8
2600 Drainage divide	A-26-9	26.7.1
2601 Drainage features	A-30-4	Sec. 30.2
2602 Drainage (runoff) on landslide.....	A-17-3	17.48
2603 Drainage subdivide.....	A-26-9	26.7.2
2604 Drill hole for exploration of high-grade ore.....	A-19-4	19.3.30
2605 Drill hole for exploration of low-grade ore	A-19-4	19.3.29
2606 Drill hole for hydrocarbon exploration or exploitation—No data available.....	A-19-6	19.5.11

	<i>Page</i>	<i>Ref. No.</i>
2607		
2608	Drill hole for hydrocarbon exploration or exploitation, showing name and number..... A-19-6	19.5.12
2609	Drill hole for hydrocarbon exploration or exploitation, showing total depth..... A-19-6	19.5.13
2610	Drill hole for mineral exploration A-19-4	19.3.25
2611	Drill hole for mineral exploration—No geologic data available A-19-4	19.3.26
2612	Drill hole for mineral exploration, showing name and number A-19-4	19.3.27
2613	Drill hole for mineral exploration, showing type..... A-19-4	19.3.28
2614	Drilling well for hydrocarbon exploration or exploitation..... A-19-6	19.5.10
2615	Dropout patterns 36	n/a
2616	Drumlin A-13-1	13.20
2617	Drumlin, flow direction unknown (1st option) A-13-1	13.21
2618	Drumlin, flow direction unknown (2nd option) A-13-1	13.22
2619	Drumlin (length mapped to scale)..... A-13-1	13.23
2620	Drumlin (length mapped to scale), flow direction unknown..... A-13-1	13.24
2621	Dry hole (nonspecific depth)..... A-19-7	19.5.19
2622	Dry hole, showing map unit at surface and at bottom of hole, and showing altitude at surface and	
2623	total depth of hole A-19-7	19.5.20
2624	Dry hole used for water exploration A-26-1	26.1.5
2625	Dry lake A-30-5	30.2.34
2626	Dry lakebed within closed depression of eolian origin in bedrock A-16-1	16.6
2627	Dry pond A-30-5	30.2.34
2628	Dry well, once used for domestic-water supply A-26-1	26.1.13
2629	Dry well, once used for industrial-water supply..... A-26-2	26.1.40
2630	Dry well, once used for irrigation-water supply..... A-26-2	26.1.31
2631	Dry well, once used for public-water supply A-26-3	26.1.49
2632	Dry well, once used for stock-water supply..... A-26-1	26.1.22
2633	Ductile shear zone A-2-16	2.14.1
2634	Dune crest A-16-1	16.1
2635		
2636	Early Archean [geologic age symbol] A-32-2	32.33
2637	Early Early Proterozoic [geologic age symbol] A-32-2	32.29
2638	Early Middle Proterozoic [geologic age symbol] A-32-2	32.25
2639	Early Proterozoic [geologic age symbol]..... A-32-2	32.26
2640	Earth flow, consisting of a relatively thick and jumbled mixture of displaced materials..... A-17-3	17.63
2641	Earthquake epicenter, magnitude 4–5.49..... A-21-1	21.6
2642	Earthquake epicenter, magnitude 5.5–5.99..... A-21-1	21.5
2643	Earthquake epicenter, magnitude 6.5–6.99..... A-21-1	21.3
2644	Earthquake epicenter, magnitude 6–6.49..... A-21-1	21.4
2645	Earthquake epicenter, magnitude 7.5 or larger A-21-1	21.1
2646	Earthquake epicenter, magnitude 7–7.49..... A-21-1	21.2
2647	Earthquake epicenter, magnitude less than 4 A-21-1	21.7

	<i>Page</i>	<i>Ref. No.</i>
2648		
2649	Earthquake-hazard features A-21-1	Sec. 21
2650	Echinoderms..... A-10-1	10.2.14
2651	Echinoids A-10-1	10.2.16
2652	Edge of dry lakebed within closed depression of eolian origin in bedrock..... A-16-1	16.6
2653	Electromagnetic survey..... A-3-1	Sec. 3
2654	Elevated plateau, planetary (mapped to scale)..... A-25-4	25.84
2655	Elevated water pipeline..... A-30-4	30.2.21
2656	Elevation of back, as shown on subsurface exploration maps..... A-19-5	19.4.15
2657	Elevation of floor, as shown on subsurface exploration maps..... A-19-5	19.4.16
2658	Elevation of glacial-lake spillway..... A-13-1	13.4
2659	Elevation of roof, as shown on subsurface exploration maps..... A-19-5	19.4.15
2660	Elevation of sill, as shown on subsurface exploration maps..... A-19-5	19.4.16
2661	En echelon cracks on landslide, indicating left-lateral shear A-17-2	17.39
2662	En echelon cracks on landslide, indicating right-lateral shear..... A-17-2	17.38
2663	En echelon fractures on landslide, indicating left-lateral shear..... A-17-2	17.39
2664	En echelon fractures on landslide, indicating right-lateral shear..... A-17-2	17.38
2665	Eolian features A-16-1	Sec. 16
2666	Epicenter, magnitude 4-5.49..... A-21-1	21.6
2667	Epicenter, magnitude 5.5-5.99 A-21-1	21.5
2668	Epicenter, magnitude 6.5-6.99 A-21-1	21.3
2669	Epicenter, magnitude 6-6.49..... A-21-1	21.4
2670	Epicenter, magnitude 7.5 or larger A-21-1	21.1
2671	Epicenter, magnitude 7-7.49..... A-21-1	21.2
2672	Epicenter, magnitude less than 4 A-21-1	21.7
2673	Erosional boundary, planetary A-25-3	25.59
2674	Erosional shoreline—Identity and existence certain, location accurate..... A-15-1	15.9
2675	Erosional shoreline—Identity and existence certain, location approximate..... A-15-1	15.11
2676	Erosional shoreline—Identity or existence questionable, location accurate..... A-15-1	15.10
2677	Erosional shoreline—Identity or existence questionable, location approximate..... A-15-1	15.12
2678	Esker, transport direction known (1st option) A-13-1	13.18
2679	Esker, transport direction known (2nd option) A-13-1	13.19
2680	Esker, transport direction unknown..... A-13-1	13.17
2681	Estimated elevation of inferred glacial-lake spillway A-13-1	13.6
2682	Eutaxitic foliation..... A-8-2	Sec. 8.2
2683	Existence [concepts and definitions]..... 22	n/a
2684	"Existence certain" [concepts and definitions] 23	n/a
2685	"Existence questionable" [concepts and definitions] 23	n/a
2686	Explanation for CMYK Color Chart..... A-39-1	Sec. 39
2687	Explanation for Pattern Chart..... A-38-1	Sec. 38
2688	Exposed wreck..... A-30-6	30.3.17

	<i>Page</i>	<i>Ref. No.</i>
2689		
2690	Extensively disturbed ground	A-19-2 Sec. 19.2
2691	Extinct spring, once used for domestic-water supply	A-26-4 26.2.7
2692	Extinct spring, once used for industrial-water supply	A-26-4 26.2.19
2693	Extinct spring, once used for irrigation-water supply	A-26-4 26.2.15
2694	Extinct spring, once used for public-water supply	A-26-4 26.2.23
2695	Extinct spring, once used for stock-water supply	A-26-4 26.2.11
2696		
2697	Fabric of short radar-bright lineaments (schematic), planetary	A-25-3 25.65
2698	Factors that influence color and pattern selection	33 n/a
2699	Falls (double-line drainage)	A-30-5 30.2.26
2700	Falls (single-line drainage)	A-30-5 30.2.25
2701	Fault—Identity and existence certain, location accurate	A-2-1 2.1.1
2702	Fault—Identity and existence certain, location approximate	A-2-1 2.1.3
2703	Fault—Identity and existence certain, location concealed	A-2-1 2.1.7
2704	Fault—Identity and existence certain, location inferred	A-2-1 2.1.5
2705	Fault—Identity or existence questionable, location accurate	A-2-1 2.1.2
2706	Fault—Identity or existence questionable, location approximate	A-2-1 2.1.4
2707	Fault—Identity or existence questionable, location concealed	A-2-1 2.1.8
2708	Fault—Identity or existence questionable, location inferred	A-2-1 2.1.6
2709	Fault-breccia zone around fault	A-2-16 2.14.4
2710	Fault-breccia zone within fault	A-2-16 2.14.3
2711	Fault creep	A-2-16 2.13.1
2712	Fault line-symbol decorations	A-2-11 Sec. 2.11
2713	Fault located by aeromagnetic survey	A-3-1 3.2.1
2714	Fault located by electromagnetic survey	A-3-1 3.2.7
2715	Fault located by gravity survey	A-3-1 3.2.3
2716	Fault located by ground magnetic survey	A-3-1 3.2.2
2717	Fault located by induced polarization survey	A-3-1 3.2.6
2718	Fault located by magnetotelluric survey	A-3-1 3.2.9
2719	Fault located by radiometric survey	A-3-1 3.2.4
2720	Fault located by resistivity survey	A-3-1 3.2.8
2721	Fault located by seismic reflection survey	A-3-1 3.2.5
2722	Fault notations	A-2-11 Sec. 2.11
2723	Fault-plane diagram for left-lateral strike-slip offset along north-striking, vertical fault	A-21-1 21.10
2724	Fault-plane diagram for normal, down-to-the-left offset along north-striking, west-dipping (at	
2725	45°) fault	A-21-1 21.11
2726	Fault-plane diagram for normal, down-to-the-left offset along northwest-striking, southwest-dipping	
2727	(at 30°) fault	A-21-1 21.12
2728	Fault-plane diagram for oblique reverse, left-side-up offset along northwest-striking,	
2729	southwest-dipping (at 60°) fault	A-21-1 21.15

	<i>Page</i>	<i>Ref. No.</i>
2730		
2731	Fault-plane diagram for reverse, left-side-up offset along north-striking, west-dipping (at 45°)	
2732	fault..... A-21-1	21.13
2733	Fault-plane diagram for reverse, left-side-up offset along northwest-striking, southwest-dipping	
2734	(at 60°) fault..... A-21-1	21.14
2735	Fault-plane diagram for right-lateral strike-slip offset along north-striking, vertical fault..... A-21-1	21.9
2736	Fault-plane diagram for vertical, down-to-the-left offset along north-striking, vertical fault..... A-21-1	21.8
2737	Fault, planetary, sense of offset unspecified—Location accurate..... A-25-1	25.5
2738	Fault, planetary, sense of offset unspecified—Location approximate..... A-25-1	25.6
2739	Fault, planetary, sense of offset unspecified—Location concealed..... A-25-1	25.8
2740	Fault, planetary, sense of offset unspecified—Location inferred..... A-25-1	25.7
2741	Fault scarps..... A-2-12	Sec. 2.12
2742	Fault showing amount of local displacement..... A-2-11	2.11.14
2743	Fault showing displacement during historic time (includes areas of known fault creep)..... A-2-16	2.13.1
2744	Fault showing displacement during Holocene time..... A-2-16	2.13.2
2745	Fault showing displacement during late Quaternary time..... A-2-16	2.13.3
2746	Fault showing displacement during Quaternary time (undifferentiated)..... A-2-16	2.13.4
2747	Fault showing local left-lateral oblique-slip offset..... A-2-11	2.11.7
2748	Fault showing local left-lateral strike-slip offset..... A-2-11	2.11.5
2749	Fault showing local normal offset (1st option: ball and bar on downthrown block)..... A-2-11	2.11.1
2750	Fault showing local normal offset (2nd option: U, upthrown block; D, downthrown block)..... A-2-11	2.11.2
2751	Fault showing local reverse offset..... A-2-11	2.11.3
2752	Fault showing local right-lateral oblique-slip offset..... A-2-11	2.11.6
2753	Fault showing local right-lateral strike-slip offset..... A-2-11	2.11.4
2754	Fault showing name..... A-2-11	2.11.15
2755	Fault symbols..... A-2-1	Sec. 2
2756	Fault zones [concepts and definitions]..... 16	n/a
2757	Faults [concepts and definitions]..... 15	n/a
2758	Faults located by geophysical methods..... A-3-1	Sec. 3.2
2759	Feature attributes [concepts and definitions]..... 11	n/a
2760	Feature attributes for locational accuracy of geologic features..... A-ii	n/a
2761	Feature attributes for scientific confidence of geologic features..... A-ii	n/a
2762	Felsenmeer..... A-14-1	14.10
2763	Ferns..... A-10-1	10.2.37
2764	FG [abbreviation]..... A-v	Table 2
2765	FGDC-approved standard..... 4	n/a
2766	"FGDC-GeoAge"..... A-32-1	Sec. 32
2767	"FGDC-GeoAge" [technical specifications in this standard]..... 42	n/a
2768	FGDC standard terminology..... 24	Fig. 1
2769	Field station locality, as shown on small-scale maps or on page-size illustrations..... A-31-1	31.22
2770	Figure showing examples of the zone of confidence for planar, linear, and point features..... 29	Fig. 3

	<i>Page</i>	<i>Ref. No.</i>
2771		
2772	Fish A-10-1	10.2.28
2773	Fish ladder A-30-4	30.2.15
2774	Fissure, volcanic A-18-2	18.41
2775	Fissures and sand and (or) other material ejected during earthquake A-21-2	21.37
2776	Fissures formed in ground by earthquake A-21-2	21.36
2777	Flint clay A-37-2	661
2778	Floodgate A-30-4	30.2.12
2779	Florida [state location map] A-34-1	Sec. 34.1
2780	Flow banding in igneous rock A-8-1	Sec. 8.2
2781	Flow direction of glacial meltwater in stream channel A-13-1	13.9
2782	Flow direction, planetary A-25-3	25.67
2783	Flow front, planetary A-25-5	25.114
2784	Flow lines on lava flow A-18-2	18.39
2785	Flow lobe—Identity and existence certain, location accurate A-18-2	18.32
2786	Flow lobe—Identity and existence certain, location approximate A-18-2	18.34
2787	Flow lobe—Identity and existence certain, location concealed A-18-2	18.36
2788	Flow lobe—Identity or existence questionable, location accurate A-18-2	18.33
2789	Flow lobe—Identity or existence questionable, location approximate A-18-2	18.35
2790	Flow lobe—Identity or existence questionable, location concealed A-18-2	18.37
2791	Flowchart showing example of logical steps that might be used to determine appropriate line	
2792	symbol styles and associated terminology 25	Fig. 2
2793	Flowering plants A-10-1	10.2.38
2794	Flowing artesian well used for industrial-water supply A-26-2	26.1.35
2795	Flowing artesian well used for irrigation-water supply A-26-2	26.1.26
2796	Flowing artesian well used for public-water supply A-26-3	26.1.44
2797	Flowing artesian well, used for domestic-water supply A-26-1	26.1.8
2798	Flowing artesian well, used for stock-water supply A-26-1	26.1.17
2799	Flume A-30-4	30.2.22
2800	Flute marks A-9-1	Sec. 9
2801	Fluvial features A-12-1	Sec. 12
2802	Fluvial terrace scarp—Identity and existence certain, location accurate A-12-1	12.1
2803	Fluvial terrace scarp—Identity and existence certain, location approximate A-12-1	12.3
2804	Fluvial terrace scarp—Identity or existence questionable, location accurate A-12-1	12.2
2805	Fluvial terrace scarp—Identity or existence questionable, location approximate A-12-1	12.4
2806	Fluvial transport direction A-12-1	12.5
2807	Focal-mechanism diagram for left-lateral strike-slip offset along north-striking, vertical fault A-21-1	21.10
2808	Focal-mechanism diagram for normal, down-to-the-left offset along north-striking, west-dipping	
2809	(at 45°) fault A-21-1	21.11
2810	Focal-mechanism diagram for normal, down-to-the-left offset along northwest-striking,	
2811	southwest-dipping (at 30°) fault A-21-1	21.12

	<i>Page</i>	<i>Ref. No.</i>
2812		
2813 Focal-mechanism diagram for oblique reverse, left-side-up offset along northwest-striking,		
2814 southwest-dipping (at 60°) fault	A-21-1	21.15
2815 Focal-mechanism diagram for reverse, left-side-up offset along north-striking, west-dipping (at		
2816 45°) fault	A-21-1	21.13
2817 Focal-mechanism diagram for reverse, left-side-up offset along northwest-striking, southwest-dipping		
2818 (at 60°) fault	A-21-1	21.14
2819 Focal-mechanism diagram for right-lateral strike-slip offset along north-striking, vertical fault	A-21-1	21.9
2820 Focal-mechanism diagram for vertical, down-to-the-left offset along north-striking, vertical fault	A-21-1	21.8
2821 Fold axis [concepts and definitions]	17	n/a
2822 Fold crest, planetary	A-25-2	25.35
2823 Fold having inclined axial surface (1st option)	A-5-13	5.10.1
2824 Fold having inclined axial surface (2nd option)	A-5-13	5.10.2
2825 Fold having near-vertical fold limbs	A-5-13	5.10.9
2826 Fold having vertical or near-vertical axial surface (1st option)	A-5-13	5.10.3
2827 Fold having vertical or near-vertical axial surface (2nd option)	A-5-13	5.10.4
2828 Fold hinges	A-9-5	Sec. 9
2829 Fold line-symbol decorations	A-5-13	Sec. 5.10
2830 Fold notations	A-5-13	Sec. 5.10
2831 Fold showing name	A-5-13	5.10.12
2832 Folds	A-5-1	Sec. 5
2833 Folds [concepts and definitions]	17	n/a
2834 Folds on landslides	A-17-2	Sec. 17
2835 Foliation	A-8-1	Sec. 8
2836 Foliation in igneous rock	A-8-1	Sec. 8.2
2837 Font ("FGDC-GeoAge")	A-32-1	Sec. 32
2838 Font selection [pertaining to map labeling]	38	n/a
2839 Foot of winze (drawn to scale), as shown on subsurface exploration maps	A-19-5	19.4.8
2840 Foraminifera	A-10-1	10.2.48
2841 Foraminifera, benthonic	A-10-1	10.2.50
2842 Foraminifera, planktonic	A-10-1	10.2.51
2843 Forest Reserve boundary	A-29-1	29.6
2844 Form line on lava flow	A-18-2	18.38
2845 Form lines showing trend of glacier	A-30-5	30.2.45
2846 Form lines showing trend of permanent snowfield	A-30-5	30.2.45
2847 Formation [concepts and definitions]	12	n/a
2848 Former marine limit—Identity and existence certain, location accurate	A-15-1	15.13
2849 Former marine limit—Identity and existence certain, location approximate	A-15-1	15.15
2850 Former marine limit—Identity and existence certain, location concealed	A-15-1	15.19
2851 Former marine limit—Identity and existence certain, location inferred	A-15-1	15.17
2852 Former marine limit—Identity or existence questionable, location accurate	A-15-1	15.14

	<i>Page</i>	<i>Ref. No.</i>
2853		
2854	Former marine limit—Identity or existence questionable, location approximate..... A-15-1	15.16
2855	Former marine limit—Identity or existence questionable, location concealed..... A-15-1	15.20
2856	Former marine limit—Identity or existence questionable, location inferred A-15-1	15.18
2857	Former shoreline—Identity and existence certain, location accurate..... A-15-1	15.13
2858	Former shoreline—Identity and existence certain, location approximate..... A-15-1	15.15
2859	Former shoreline—Identity and existence certain, location concealed..... A-15-1	15.19
2860	Former shoreline—Identity and existence certain, location inferred A-15-1	15.17
2861	Former shoreline—Identity or existence questionable, location accurate A-15-1	15.14
2862	Former shoreline—Identity or existence questionable, location approximate A-15-1	15.16
2863	Former shoreline—Identity or existence questionable, location concealed A-15-1	15.20
2864	Former shoreline—Identity or existence questionable, location inferred A-15-1	15.18
2865	Fossil locality A-10-1	Sec. 10.1
2866	Fossil locality, showing collection number A-10-1	10.1.1
2867	Fossil symbols A-10-1	Sec. 10.2
2868	Fossiliferous bedded chert..... A-37-2	651
2869	Fossiliferous clastic limestone..... A-37-1	629
2870	Fossiliferous rock..... A-37-2	652
2871	Four-wheel-drive road (Class 5)..... A-28-1	28.14
2872	Fracture zone, planetary A-25-6	25.132
2873	Fractures on landslides..... A-17-2	Sec. 17
2874	Fumarole..... A-18-3	18.64
2875	Fumarole, as shown on topographic maps or on general-purpose or smaller scale maps..... A-30-6	30.3.13
2876	Fungi A-10-1	10.2.40
2877	Furrow, planetary..... A-25-3	25.51
2878	Fusulinids..... A-10-1	10.2.49
2879		
2880	Gaging station, as shown on topographic maps or on general-purpose or smaller scale maps..... A-30-6	30.3.14
2881	Gas and condensate show A-19-10	19.5.82
2882	Gas and condensate well (nonspecific depth)..... A-19-10	19.5.83
2883	Gas field—Extent defined..... A-19-6	19.5.3
2884	Gas field—Extent not yet defined..... A-19-6	19.5.4
2885	Gas fields A-19-6	Sec. 19.5
2886	Gas seep..... A-19-8	19.5.49
2887	Gas show..... A-19-8	19.5.50
2888	Gas storage well (nonspecific depth) A-19-10	19.5.92
2889	Gas well (nonspecific depth)..... A-19-8	19.5.51
2890	Gas well, as shown on topographic maps or on general-purpose or smaller scale maps..... A-30-6	30.3.9
2891	Gas wells..... A-19-8	Sec. 19.5
2892	Gastropods..... A-10-1	10.2.23
2893	Generic foliation (origin not known or not specified) A-8-1	Sec. 8.1

	<i>Page</i>	<i>Ref. No.</i>
2894		
2895 Gently inclined (between 0° and 30°) bedding, as determined remotely or from aerial		
2896 photographs.....	A-6-2	6.40
2897 Gently overturned (between 0° and 30°) bedding, as determined remotely or from aerial		
2898 photographs.....	A-6-2	6.44
2899 Geohydrologic contours	A-26-7	Sec. 26.5
2900 Geohydrologic features	A-26-1	Sec. 26
2901 Geohydrologic lines	A-26-8	Sec. 26.6
2902 Geologic age symbol font ("FGDC-GeoAge")	A-32-1	Sec. 32
2903 Geologic age symbol font [technical specifications in this standard]	42	n/a
2904 Geologic age symbols.....	A-32-1	Sec. 32
2905 Geologic age symbols [concepts and definitions].....	12	n/a
2906 Geologic map databases [concepts and definitions]	11	n/a
2907 Geologic map symbols [concepts and definitions].....	11	n/a
2908 Geologic map units [concepts and definitions].....	11	n/a
2909 Geologic mapping concepts and definitions	10	n/a
2910 Geologic maps [concepts and definitions]	10	n/a
2911 Geologic point features [concepts and definitions]	18	n/a
2912 Geologic time [concepts and definitions]	12	n/a
2913 Geophysical contour around closed area of lower values (index)—Accurately located.....	A-11-1	11.3
2914 Geophysical contour around closed area of lower values (index)—Approximately located.....	A-11-1	11.5
2915 Geophysical contour around closed area of lower values (intermediate)—Accurately located.....	A-11-1	11.7
2916 Geophysical contour around closed area of lower values (intermediate)—Approximately located.....	A-11-1	11.9
2917 Geophysical contour (index)—Accurately located	A-11-1	11.1
2918 Geophysical contour (index)—Approximately located	A-11-1	11.4
2919 Geophysical contour (index), showing datum	A-11-1	11.2
2920 Geophysical contour (intermediate)—Accurately located	A-11-1	11.6
2921 Geophysical contour (intermediate)—Approximately located	A-11-1	11.8
2922 Geophysical contours	A-11-1	Sec. 11
2923 Geophysical data collection line—Accurately located	A-3-1	3.3.1
2924 Geophysical data collection line—Located by aerial survey	A-3-1	3.3.2
2925 Geophysical data collection locality	A-11-1	11.10
2926 Geophysical data collection locality—Showing value where known	A-11-1	11.11
2927 Geophysical survey lines and stations	A-3-1	Sec. 3.3
2928 Georgia [state location map]	A-34-1	Sec. 34.1
2929 Geothermal well, as shown on topographic maps or on general-purpose or smaller scale maps.....	A-30-6	30.3.11
2930 Geyser.....	A-18-3	18.63
2931 Geyser, as shown on topographic maps or on general-purpose or smaller scale maps.....	A-30-6	30.3.13
2932 Glacial advance	A-13-3	Sec. 13
2933 Glacial features	A-13-1	Sec. 13
2934 Glacial grooves	A-13-2	Sec. 13

	<i>Page</i>	<i>Ref. No.</i>
2935		
2936	Glacial limit—Identity and existence certain, location accurate	A-13-3 13.49
2937	Glacial limit—Identity and existence certain, location approximate	A-13-3 13.51
2938	Glacial limit—Identity and existence certain, location concealed	A-13-3 13.55
2939	Glacial limit—Identity and existence certain, location inferred.....	A-13-3 13.53
2940	Glacial limit—Identity or existence questionable, location accurate.....	A-13-3 13.50
2941	Glacial limit—Identity or existence questionable, location approximate.....	A-13-3 13.52
2942	Glacial limit—Identity or existence questionable, location concealed.....	A-13-3 13.56
2943	Glacial limit—Identity or existence questionable, location inferred	A-13-3 13.54
2944	Glacial limit, showing name of glaciation.....	A-13-3 13.57
2945	Glacial meltwater stream	A-13-1 13.7
2946	Glacial meltwater stream channel (mapped to scale).....	A-13-1 13.8
2947	Glacial patterns (Series 500)	Pattern Chart n/a
2948	Glacial striations	A-13-2 Sec. 13
2949	Glacial terminus—Identity and existence certain, location approximate	A-13-3 13.51
2950	Glacial terminus—Identity and existence certain, location concealed	A-13-3 13.55
2951	Glacial terminus—Identity and existence certain, location inferred.....	A-13-3 13.53
2952	Glacial terminus—Identity or existence questionable, location accurate	A-13-3 13.50
2953	Glacial terminus—Identity or existence questionable, location approximate	A-13-3 13.52
2954	Glacial terminus—Identity or existence questionable, location concealed	A-13-3 13.56
2955	Glacial terminus—Identity or existence questionable, location inferred.....	A-13-3 13.54
2956	Glacial terminus, showing name of glaciation.....	A-13-3 13.57
2957	Glacial-lake spillway	A-13-1 13.3
2958	Glacial-lake spillway, showing elevation	A-13-1 13.4
2959	Glacially scoured basin	A-13-2 Sec. 13
2960	Glacier.....	A-30-5 30.2.44
2961	Glacier contours	A-30-3 Sec. 30.1
2962	Glacier crevasse.....	A-13-1 13.1
2963	Glaciofluvial features	A-13-1 Sec. 13
2964	Glauconite	A-37-2 663
2965	Glory hole	A-19-3 19.3.4
2966	Gneiss	A-37-3 708
2967	Gneissic layering	A-8-5 Sec. 8.3
2968	Gneissoid granite	A-37-3 704
2969	Graben trace, planetary (shown as single line where bounding normal faults cannot be mapped	
2970	separately)—Location accurate.....	A-25-2 25.25
2971	Graben trace, planetary (shown as single line where bounding normal faults cannot be mapped	
2972	separately)—Location approximate.....	A-25-2 25.26
2973	Graben trace, planetary (shown as single line where bounding normal faults cannot be mapped	
2974	separately)—Location concealed.....	A-25-2 25.28
2975		

	<i>Page</i>	<i>Ref. No.</i>
2976		
2977	Graben trace, planetary (shown as single line where bounding normal faults cannot be mapped	
2978	separately)—Location inferred	A-25-2 25.27
2979	Gradational contact—Identity and existence certain, location accurate.....	A-1-1 1.1.17
2980	Gradational contact—Identity and existence certain, location approximate.....	A-1-1 1.1.19
2981	Gradational contact—Identity and existence certain, location concealed.....	A-1-1 1.1.23
2982	Gradational contact—Identity and existence certain, location inferred	A-1-1 1.1.21
2983	Gradational contact—Identity or existence questionable, location accurate	A-1-1 1.1.18
2984	Gradational contact—Identity or existence questionable, location approximate	A-1-1 1.1.20
2985	Gradational contact—Identity or existence questionable, location concealed	A-1-1 1.1.24
2986	Gradational contact—Identity or existence questionable, location inferred.....	A-1-1 1.1.22
2987	Gradational contacts [concepts and definitions].....	14 n/a
2988	Graded area where extensive amount of mapped geologic unit has been removed	A-19-2 19.2.1
2989	Graded bedding	A-6-2 Sec. 6
2990	Granite (1st option).....	A-37-3 718
2991	Granite (2nd option).....	A-37-3 719
2992	Graptolites	A-10-1 10.2.17
2993	Gravel (1st option).....	A-37-1 601
2994	Gravel (2nd option).....	A-37-1 602
2995	Gravel pit	A-19-3 19.3.2
2996	Gravel pit, as shown on topographic maps or on general-purpose or smaller scale maps	A-30-6 30.3.2
2997	Gravity survey	A-3-1 Sec. 3
2998	Green [spot color]	A-v Table 3
2999	Groove (generic), planetary	A-25-3 25.47
3000	Grooves, glacial.....	A-13-2 Sec. 13
3001	Grooves in sedimentary materials.....	A-9-1 Sec. 9
3002	Grooves on fault surface.....	A-9-1 Sec. 9
3003	Ground magnetic survey.....	A-3-1 Sec. 3
3004	Ground-water barrier (geologic)—Accurately located.....	A-26-9 26.7.5
3005	Ground-water barrier (geologic)—Approximately located	A-26-9 26.7.6
3006	Ground-water divide—Accurately located.....	A-26-9 26.7.3
3007	Ground-water divide—Approximately located.....	A-26-9 26.7.4
3008	Guam [location map].....	A-34-1 Sec. 34.1
3009	Guidelines for color selection.....	33 n/a
3010	Guidelines for map labeling.....	37 n/a
3011	Guidelines for pattern selection.....	33 n/a
3012	Gully on landslide	A-17-3 17.46
3013	Guyot.....	A-22-2 22.35
3014	Gypsum	A-37-2 667
3015		
3016	H [abbreviation]	A-v Table 2

	<i>Page</i>	<i>Ref. No.</i>
3017		
3018	Halo without associated crater, planetary A-25-6	25.135
3019	Hawaii [state location map] A-34-1	Sec. 34.1
3020	Hawaii Homestead boundary A-29-1	29.6
3021	Hazardous waste site A-20-1	20.1
3022	Hazardous waste site—Clean-up activities are in progress A-20-1	20.5
3023	Hazardous waste site—Clean-up activities have been completed A-20-1	20.6
3024	Hazardous waste site, showing direction of surface-leachate flow from site A-20-1	20.2
3025	Hazardous waste site, showing larger restricted area (mapped to scale) A-20-1	20.8
3026	Hazardous waste site, showing smaller restricted area (mapped to scale) A-20-1	20.7
3027	HB [abbreviation] A-v	Table 2
3028	Head of raise (drawn to scale), as shown on subsurface exploration maps A-19-5	19.4.6
3029	Head scarp of landslide—Active, sharp, distinct, and accurately located A-17-1	17.12
3030	Head scarp of landslide—Inactive, subdued, indistinct, and (or) approximately located A-17-1	17.13
3031	Head scarp of landslide, showing height A-17-1	17.14
3032	Head scarp of rotated block in landslide A-17-1	17.15
3033	Headwall of adjoining cirques A-13-2	13.42
3034	Headwall of cirque A-13-2	13.41
3035	Helvetica [font] 38	n/a
3036	HI [abbreviation] A-v	Table 2
3037	High-angle faults A-2-1	Sec. 2.1
3038	Highway (generic) A-28-1	28.1
3039	Highways A-28-1	Sec. 28
3040	Hinge line [concepts and definitions] 17	n/a
3041	Historic displacement A-2-16	2.13.1
3042	Historically active debris flow, showing a sharply defined morphology A-17-3	17.56
3043	Historically active landslide (mapped to scale), showing a sharply defined morphology A-17-3	17.58
3044	Historically used terminology 24	Fig. 1
3045	Holocene displacement A-2-16	2.13.2
3046	Horizontal aligned deformed-mineral lineation (1st option) A-9-2	9.47
3047	Horizontal aligned deformed-mineral lineation (2nd option) A-9-2	9.48
3048	Horizontal aligned mineral-aggregate lineation (1st option) A-9-2	9.43
3049	Horizontal aligned mineral-aggregate lineation (2nd option) A-9-2	9.44
3050	Horizontal aligned stretched-object lineation (1st option) A-9-3	9.51
3051	Horizontal aligned stretched-object lineation (2nd option) A-9-3	9.52
3052	Horizontal aligned stretched-oid lineation (1st option) A-9-3	9.59
3053	Horizontal aligned stretched-oid lineation (2nd option) A-9-3	9.60
3054	Horizontal aligned stretched-pebble lineation (1st option) A-9-3	9.55
3055	Horizontal aligned stretched-pebble lineation (2nd option) A-9-3	9.56
3056	Horizontal aligned-clast or aligned-grain lineation (in sedimentary materials) (1st option) A-9-2	9.31
3057	Horizontal aligned-clast or aligned-grain lineation (in sedimentary materials) (2nd option) A-9-2	9.32

	<i>Page</i>	<i>Ref. No.</i>
3058		
3059 Horizontal aligned-inclusion lineation (in igneous rocks) (1st option).....	A-9-2	9.35
3060 Horizontal aligned-inclusion lineation (in igneous rocks) (2nd option).....	A-9-2	9.36
3061 Horizontal aligned-mineral lineation (1st option).....	A-9-2	9.39
3062 Horizontal aligned-mineral lineation (2nd option).....	A-9-2	9.40
3063 Horizontal aligned-object lineation (1st option).....	A-9-2	9.27
3064 Horizontal aligned-object lineation (2nd option).....	A-9-2	9.28
3065 Horizontal asymmetric (S-shaped, counterclockwise sense of shear) kink-band crenulation lineation		
3066 (1st option)	A-9-6	9.139
3067 Horizontal asymmetric (S-shaped, counterclockwise sense of shear) kink-band crenulation lineation		
3068 (2nd option)	A-9-6	9.140
3069 Horizontal asymmetric (S-shaped, counterclockwise sense of shear) minor fold hinge (1st option) ...	A-9-6	9.127
3070 Horizontal asymmetric (S-shaped, counterclockwise sense of shear) minor fold hinge (2nd option) ..	A-9-6	9.128
3071 Horizontal asymmetric (Z-shaped, clockwise sense of shear) kink-band crenulation lineation (1st		
3072 option).....	A-9-6	9.143
3073 Horizontal asymmetric (Z-shaped, clockwise sense of shear) kink-band crenulation lineation (2nd		
3074 option).....	A-9-6	9.144
3075 Horizontal asymmetric (Z-shaped, clockwise sense of shear) minor fold hinge (1st option)	A-9-6	9.131
3076 Horizontal asymmetric (Z-shaped, clockwise sense of shear) minor fold hinge (2nd option)	A-9-6	9.132
3077 Horizontal bedding	A-6-1	6.1
3078 Horizontal bedding, as determined remotely or from aerial photographs.....	A-6-2	6.39
3079 Horizontal boudins (1st option).....	A-9-3	9.71
3080 Horizontal boudins (2nd option).....	A-9-3	9.72
3081 Horizontal cleavage (generic or type unspecified)	A-7-1	7.1
3082 Horizontal continuous, penetrative foliation.....	A-8-3	8.3.16
3083 Horizontal continuous, slaty cleavage	A-7-1	7.7
3084 Horizontal control point	A-3-1	3.3.4
3085 Horizontal crenulation lineation (1st option)	A-9-6	9.135
3086 Horizontal crenulation lineation (2nd option)	A-9-6	9.136
3087 Horizontal cumulate foliation	A-8-1	8.2.10
3088 Horizontal disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation		
3089 cleavage.....	A-7-2	7.25
3090 Horizontal disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation		
3091 foliation	A-8-4	8.3.34
3092 Horizontal disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation cleavage.....	A-7-2	7.31
3093 Horizontal disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation foliation.....	A-8-4	8.3.40
3094 Horizontal disjunctive, spaced cleavage.....	A-7-1	7.13
3095 Horizontal disjunctive, spaced foliation	A-8-4	8.3.22
3096 Horizontal disjunctive, symmetric crenulation cleavage.....	A-7-1	7.19
3097 Horizontal disjunctive, symmetric crenulation foliation	A-8-4	8.3.28
3098 Horizontal eutaxitic foliation.....	A-8-2	8.2.19

	<i>Page</i>	<i>Ref. No.</i>
3099		
3100 Horizontal flow banding, lamination, or foliation in igneous rock	A-8-1	8.2.2
3101 Horizontal fold hinge of generic (type or orientation unspecified) small, minor fold (1st option)	A-9-5	9.99
3102 Horizontal fold hinge of generic (type or orientation unspecified) small, minor fold (2nd option)	A-9-5	9.100
3103 Horizontal fold hinge of small, minor anticline (1st option)—Ball on topographically higher side		
3104 of fold	A-9-5	9.107
3105 Horizontal fold hinge of small, minor anticline (2nd option)—Ball on topographically higher side		
3106 of fold	A-9-5	9.108
3107 Horizontal fold hinge of small, minor antiform (1st option)—Ball on topographically higher side		
3108 of fold	A-9-5	9.111
3109 Horizontal fold hinge of small, minor antiform (2nd option)—Ball on topographically higher side		
3110 of fold	A-9-5	9.112
3111 Horizontal fold hinge of small, minor penecontemporaneous soft-sediment fold (1st option)	A-9-5	9.103
3112 Horizontal fold hinge of small, minor penecontemporaneous soft-sediment fold (2nd option)	A-9-5	9.104
3113 Horizontal fold hinge of small, minor syncline (1st option)—Ball on topographically higher side		
3114 of fold	A-9-5	9.115
3115 Horizontal fold hinge of small, minor syncline (2nd option)—Ball on topographically higher side		
3116 of fold	A-9-5	9.116
3117 Horizontal fold hinge of small, minor synform (1st option)—Ball on topographically higher side		
3118 of fold	A-9-5	9.119
3119 Horizontal fold hinge of small, minor synform (2nd option)—Ball on topographically higher side		
3120 of fold	A-9-5	9.120
3121 Horizontal generic (origin not known or not specified) foliation	A-8-1	8.1.1
3122 Horizontal generic (origin or type not known or not specified) lineation or linear structure (1st		
3123 option).....	A-9-1	9.5
3124 Horizontal generic (origin or type not known or not specified) lineation or linear structure (2nd		
3125 option).....	A-9-1	9.6
3126 Horizontal gneissic layering.....	A-8-5	8.3.46
3127 Horizontal lineation at intersection of bedding and cleavage (1st option).....	A-9-4	9.79
3128 Horizontal lineation at intersection of bedding and cleavage (2nd option).....	A-9-4	9.80
3129 Horizontal lineation at intersection of two cleavages (1st option).....	A-9-4	9.83
3130 Horizontal lineation at intersection of two cleavages (2nd option).....	A-9-4	9.84
3131 Horizontal lineation at intersection of two foliations (1st option)	A-9-4	9.91
3132 Horizontal lineation at intersection of two foliations (2nd option)	A-9-4	9.92
3133 Horizontal lineation at intersection of two fractures or joints (1st option).....	A-9-4	9.87
3134 Horizontal lineation at intersection of two fractures or joints (2nd option).....	A-9-4	9.88
3135 Horizontal lineation at intersection of two surfaces (origin or type unspecified) (1st option)	A-9-4	9.95
3136 Horizontal lineation at intersection of two surfaces (origin or type unspecified) (2nd option)	A-9-4	9.96
3137 Horizontal metamorphic or tectonic foliation.....	A-8-3	8.3.1
3138 Horizontal metamorphic or tectonic foliation parallel to bedding	A-8-3	8.3.7
3139 Horizontal mullions (1st option).....	A-9-3	9.67
3140 Horizontal mullions (2nd option).....	A-9-3	9.68

	<i>Page</i>	<i>Ref. No.</i>
3141		
3142 Horizontal mylonitic foliation	A-8-5	8.3.55
3143 Horizontal parting lineation in sedimentary materials (1st option)	A-9-1	9.11
3144 Horizontal parting lineation in sedimentary materials (2nd option)	A-9-1	9.12
3145 Horizontal pencil structure (1st option).....	A-9-4	9.75
3146 Horizontal pencil structure (2nd option).....	A-9-4	9.76
3147 Horizontal rodding (1st option).....	A-9-3	9.63
3148 Horizontal rodding (2nd option).....	A-9-3	9.64
3149 Horizontal slickenline, groove, or striation on fault surface (1st option)	A-9-1	9.19
3150 Horizontal slickenline, groove, or striation on fault surface (2nd option)	A-9-1	9.20
3151 Horizontal sole mark, tool mark, scour mark, flute mark, groove, or channel in sedimentary		
3152 materials (1st option).....	A-9-1	9.15
3153 Horizontal sole mark, tool mark, scour mark, flute mark, groove, or channel in sedimentary		
3154 materials (2nd option).....	A-9-1	9.16
3155 Horizontal surface groove or striation (origin not known or not specified) (1st option).....	A-9-1	9.23
3156 Horizontal surface groove or striation (origin not known or not specified) (2nd option).....	A-9-1	9.24
3157 Horizontal symmetric minor fold hinge (1st option).....	A-9-6	9.123
3158 Horizontal symmetric minor fold hinge (2nd option).....	A-9-6	9.124
3159 Horizontal undulatory gneissic layering	A-8-5	8.3.52
3160 Hornito, large.....	A-18-3	18.58
3161 Hornito, small	A-18-3	18.57
3162 How to use [the contents of] this standard	A-ii	n/a
3163 HSV [abbreviation].....	A-v	Table 2
3164 HSV color model	35	n/a
3165 Hummock on landslide (mapped to scale)	A-17-3	17.50
3166 Hummock on landslide (shown as point symbol when too small to outline at map scale)	A-17-3	17.51
3167 Hummocky topography (1st option)	A-13-2	13.26
3168 Hummocky topography (2nd option)	A-13-2	13.27
3169 Hummocky topography (3rd option).....	A-13-2	13.28
3170 Hydrographic features	A-30-1	Sec. 30
3171		
3172 Ice-channel deposit, known transport direction (1st option).....	A-13-1	13.18
3173 Ice-channel deposit, known transport direction (2nd option).....	A-13-1	13.19
3174 Ice-channel deposit, unknown transport direction	A-13-1	13.17
3175 Ice-contact lava-flow margin—Identity and existence certain, location accurate	A-18-3	18.48
3176 Ice-contact lava-flow margin—Identity and existence certain, location approximate	A-18-3	18.50
3177 Ice-contact lava-flow margin—Identity and existence certain, location concealed	A-18-3	18.52
3178 Ice-contact lava-flow margin—Identity or existence questionable, location accurate	A-18-3	18.49
3179 Ice-contact lava-flow margin—Identity or existence questionable, location approximate	A-18-3	18.51
3180 Ice-contact lava-flow margin—Identity or existence questionable, location concealed	A-18-3	18.53
3181 Ice-contact slope	A-13-1	13.16

	<i>Page</i>	<i>Ref. No.</i>
3182		
3183 Ice-flow direction.....	A-13-1	13.2
3184 Ice margin	A-13-3	Sec. 13
3185 Ice-wedge polygon	A-14-1	14.8
3186 Ice-wedge polygons	A-14-1	14.9
3187 Idaho [state location map]	A-34-1	Sec. 34.1
3188 Identity [concepts and definitions]	22	n/a
3189 "Identity and existence certain" [concepts and definitions].....	23	n/a
3190 "Identity certain" [concepts and definitions].....	22	n/a
3191 "Identity or existence questionable" [concepts and definitions].....	23	n/a
3192 "Identity questionable" [concepts and definitions].....	22	n/a
3193 Igneous foliation	A-8-1	Sec. 8.2
3194 Igneous layering	A-8-1	Sec. 8.2
3195 Igneous patterns (Series 300)	Pattern Chart	n/a
3196 Igneous rock (1st option)	A-37-3	721
3197 Igneous rock (2nd option)	A-37-3	722
3198 Igneous rock (3rd option).....	A-37-3	723
3199 Igneous rock (4th option).....	A-37-3	724
3200 Igneous rock (5th option).....	A-37-3	725
3201 Igneous rock (6th option).....	A-37-3	726
3202 Igneous rock (7th option).....	A-37-3	727
3203 Igneous rock (8th option).....	A-37-3	728
3204 Igneous-rock lithologic patterns	A-37-3	Sec. 37.2
3205 Illinois [state location map]	A-34-1	Sec. 34.1
3206 Impact craters, planetary.....	A-25-5	Sec. 25
3207 Impact craters (terrestrial)	A-24-1	Sec. 24
3208 Impact features (terrestrial).....	A-24-1	Sec. 24
3209 Implementation [of this standard]	4	n/a
3210 Impure coal	A-37-2	659
3211 Inaccessible adit (1st option).....	A-19-3	19.3.12
3212 Inaccessible adit (2nd option).....	A-19-3	19.3.17
3213 Inaccessible portal	A-19-3	19.3.22
3214 Inaccessible tunnel entrance (1st option).....	A-19-3	19.3.12
3215 Inaccessible tunnel entrance (2nd option).....	A-19-3	19.3.17
3216 Inaccessible vertical mine shaft, as shown on smaller scale or general-purpose maps.....	A-19-4	19.3.37
3217 Inaccessible workings (drawn to scale), as shown on subsurface exploration maps	A-19-5	19.4.11
3218 Inactive (closed) hazardous waste site	A-20-1	20.4
3219 Inactive quality-of-water site.....	A-26-6	26.4.2
3220 Inactive volcano on small-scale maps	A-18-3	18.67
3221 Inches (in) to points (pts) or millimeters (mm).....	A-iv	Table 1
3222 Incipient sliding on landslide	A-17-3	17.47

	<i>Page</i>	<i>Ref. No.</i>
3223		
3224	Incised-scarp sedimentary contact—Identity and existence certain, location accurate	A-1-2 1.1.33
3225	Incised-scarp sedimentary contact—Identity and existence certain, location approximate	A-1-2 1.1.35
3226	Incised-scarp sedimentary contact—Identity or existence questionable, location accurate	A-1-2 1.1.34
3227	Incised-scarp sedimentary contact—Identity or existence questionable, location approximate	A-1-2 1.1.36
3228	Inclined aligned-clast or aligned-grain lineation (in sedimentary materials) (1st option)	A-9-2 9.29
3229	Inclined aligned-clast or aligned-grain lineation (in sedimentary materials) (2nd option)	A-9-2 9.30
3230	Inclined aligned deformed-mineral lineation (1st option).....	A-9-2 9.45
3231	Inclined aligned deformed-mineral lineation (2nd option).....	A-9-2 9.46
3232	Inclined aligned-inclusion lineation (in igneous rocks) (1st option).....	A-9-2 9.33
3233	Inclined aligned-inclusion lineation (in igneous rocks) (2nd option).....	A-9-2 9.34
3234	Inclined aligned mineral-aggregate lineation (1st option)	A-9-2 9.41
3235	Inclined aligned mineral-aggregate lineation (2nd option)	A-9-2 9.42
3236	Inclined aligned-mineral lineation (1st option).....	A-9-2 9.37
3237	Inclined aligned-mineral lineation (2nd option).....	A-9-2 9.38
3238	Inclined aligned-object lineation (1st option).....	A-9-2 9.25
3239	Inclined aligned-object lineation (2nd option).....	A-9-2 9.26
3240	Inclined aligned stretched-object lineation (1st option)	A-9-3 9.49
3241	Inclined aligned stretched-object lineation (2nd option)	A-9-3 9.50
3242	Inclined aligned stretched-oid lineation (1st option)	A-9-3 9.57
3243	Inclined aligned stretched-oid lineation (2nd option)	A-9-3 9.58
3244	Inclined aligned stretched-pebble lineation (1st option)	A-9-3 9.53
3245	Inclined aligned stretched-pebble lineation (2nd option)	A-9-3 9.54
3246	Inclined asymmetric (S-shaped, counterclockwise sense of shear) kink-band crenulation lineation	
3247	(1st option)	A-9-6 9.137
3248	Inclined asymmetric (S-shaped, counterclockwise sense of shear) kink-band crenulation lineation	
3249	(2nd option)	A-9-6 9.138
3250	Inclined asymmetric (S-shaped, counterclockwise sense of shear) minor fold hinge (1st option)	A-9-6 9.125
3251	Inclined asymmetric (S-shaped, counterclockwise sense of shear) minor fold hinge (2nd option)	A-9-6 9.126
3252	Inclined asymmetric (Z-shaped, clockwise sense of shear) kink-band crenulation lineation (1st	
3253	option).....	A-9-6 9.141
3254	Inclined asymmetric (Z-shaped, clockwise sense of shear) kink-band crenulation lineation (2nd	
3255	option).....	A-9-6 9.142
3256	Inclined asymmetric (Z-shaped, clockwise sense of shear) minor fold hinge (1st option)	A-9-6 9.129
3257	Inclined asymmetric (Z-shaped, clockwise sense of shear) minor fold hinge (2nd option)	A-9-6 9.130
3258	Inclined axial surface of fold (1st option)	A-5-13 5.10.1
3259	Inclined axial surface of fold (2nd option)	A-5-13 5.10.2
3260	Inclined bed of economically important commodity (1st option).....	A-1-6 1.4.1
3261	Inclined bed of economically important commodity (2nd option).....	A-1-6 1.4.2
3262	Inclined bedding	A-6-1 6.2
3263	Inclined bedding in crossbedded rocks	A-6-2 6.30

	<i>Page</i>	<i>Ref. No.</i>
3264		
3265	Inclined bedding, where top direction of beds is known from local features.....	A-6-1 6.13
3266	Inclined boudins (1st option).....	A-9-3 9.69
3267	Inclined boudins (2nd option).....	A-9-3 9.70
3268	Inclined channel in sedimentary materials (1st option).....	A-9-1 9.13
3269	Inclined channel in sedimentary materials (2nd option).....	A-9-1 9.14
3270	Inclined clay bed (1st option).....	A-1-6 1.4.1
3271	Inclined clay bed (2nd option).....	A-1-6 1.4.2
3272	Inclined cleavage (generic or type unspecified).....	A-7-1 7.2
3273	Inclined coal bed (1st option).....	A-1-6 1.4.1
3274	Inclined coal bed (2nd option).....	A-1-6 1.4.2
3275	Inclined contact (1st option).....	A-1-6 1.4.1
3276	Inclined contact (2nd option).....	A-1-6 1.4.2
3277	Inclined continuous, penetrative foliation.....	A-8-3 8.3.17
3278	Inclined continuous, slaty cleavage.....	A-7-1 7.8
3279	Inclined contorted bedding.....	A-6-2 6.25
3280	Inclined crenulated bedding.....	A-6-2 6.25
3281	Inclined crenulation lineation (1st option).....	A-9-6 9.133
3282	Inclined crenulation lineation (2nd option).....	A-9-6 9.134
3283	Inclined crinkled or deformed cumulate foliation.....	A-8-2 8.2.17
3284	Inclined crinkled or deformed eutaxitic foliation.....	A-8-2 8.2.25
3285	Inclined crinkled or deformed flow banding, lamination, or foliation in igneous rock.....	A-8-1 8.2.8
3286	Inclined crinkled or deformed metamorphic or tectonic foliation.....	A-8-3 8.3.14
3287	Inclined cumulate foliation.....	A-8-1 8.2.11
3288	Inclined cumulate foliation, where top direction of layers is known from local features.....	A-8-1 8.2.14
3289	Inclined dike (1st option).....	A-1-6 1.4.1
3290	Inclined dike (2nd option).....	A-1-6 1.4.2
3291	Inclined (dip direction to left) bedding, for multiple observations at one locality.....	A-6-1 6.7
3292	Inclined (dip direction to left) bedding, where top direction of beds is known from local features,	
3293	for multiple observations at one locality.....	A-6-1 6.18
3294	Inclined (dip direction to left) cleavage (generic or type unspecified), for multiple observations at	
3295	one locality.....	A-7-1 7.5
3296	Inclined (dip direction to left) continuous, penetrative foliation, for multiple observations at	
3297	one locality.....	A-8-3 8.3.20
3298	Inclined (dip direction to left) continuous, slaty cleavage, for multiple observations at one	
3299	locality.....	A-7-1 7.11
3300	Inclined (dip direction to left) disjunctive, asymmetric (S-shaped, counterclockwise sense of	
3301	shear) crenulation cleavage, for multiple observations at one locality.....	A-7-2 7.29
3302	Inclined (dip direction to left) disjunctive, asymmetric (S-shaped, counterclockwise sense of	
3303	shear) crenulation foliation, for multiple observations at one locality.....	A-8-4 8.3.38
3304		

	<i>Page</i>	<i>Ref. No.</i>
3305		
3306	Inclined (dip direction to left) disjunctive, asymmetric (Z-shaped, clockwise sense of shear)	
3307	crenulation cleavage, for multiple observations at one locality	A-7-2 7.35
3308	Inclined (dip direction to left) disjunctive, asymmetric (Z-shaped, clockwise sense of shear)	
3309	crenulation foliation, for multiple observations at one locality.....	A-8-4 8.3.44
3310	Inclined (dip direction to left) disjunctive, spaced cleavage, for multiple observations at one	
3311	locality	A-7-1 7.17
3312	Inclined (dip direction to left) disjunctive, spaced foliation, for multiple observations at one	
3313	locality	A-8-4 8.3.26
3314	Inclined (dip direction to left) disjunctive, symmetric crenulation cleavage, for multiple	
3315	observations at one locality	A-7-1 7.23
3316	Inclined (dip direction to left) disjunctive, symmetric crenulation foliation, for multiple	
3317	observations at one locality	A-8-4 8.3.32
3318	Inclined (dip direction to left) eutaxitic foliation, for multiple observations at one locality	A-8-2 8.2.23
3319	Inclined (dip direction to left) flow banding, lamination, or foliation in igneous rock, for	
3320	multiple observations at one locality.....	A-8-1 8.2.6
3321	Inclined (dip direction to left) generic (origin not known or not specified) foliation, for multiple	
3322	observations at one locality	A-8-1 8.1.5
3323	Inclined (dip direction to left) gneissic layering, for multiple observations at one locality	A-8-5 8.3.50
3324	Inclined (dip direction to left) metamorphic or tectonic foliation, for multiple observations at	
3325	one locality	A-8-3 8.3.5
3326	Inclined (dip direction to left) mylonitic foliation, for multiple observations at one locality	A-8-5 8.3.59
3327	Inclined (dip direction to right) bedding, for multiple observations at one locality	A-6-1 6.6
3328	Inclined (dip direction to right) bedding, where top direction of beds is known from local features,	
3329	for multiple observations at one locality	A-6-1 6.17
3330	Inclined (dip direction to right) cleavage (generic or type unspecified), for multiple observations	
3331	at one locality	A-7-1 7.4
3332	Inclined (dip direction to right) continuous, penetrative foliation, for multiple observations at one	
3333	locality	A-8-3 8.3.19
3334	Inclined (dip direction to right) continuous, slaty cleavage, for multiple observations at one	
3335	locality	A-7-1 7.10
3336	Inclined (dip direction to right) disjunctive, asymmetric (S-shaped, counterclockwise sense of	
3337	shear) crenulation cleavage, for multiple observations at one locality	A-7-2 7.28
3338	Inclined (dip direction to right) disjunctive, asymmetric (S-shaped, counterclockwise sense of	
3339	shear) crenulation foliation, for multiple observations at one locality	A-8-4 8.3.37
3340	Inclined (dip direction to right) disjunctive, asymmetric (Z-shaped, clockwise sense of shear)	
3341	crenulation cleavage, for multiple observations at one locality	A-7-2 7.34
3342	Inclined (dip direction to right) disjunctive, asymmetric (Z-shaped, clockwise sense of shear)	
3343	crenulation foliation, for multiple observations at one locality.....	A-8-4 8.3.43
3344	Inclined (dip direction to right) disjunctive, spaced cleavage, for multiple observations at one	
3345	locality	A-7-1 7.16
3346		

	<i>Page</i>	<i>Ref. No.</i>
3347		
3348	Inclined (dip direction to right) disjunctive, spaced foliation, for multiple observations at one	
3349	locality	A-8-4 8.3.25
3350	Inclined (dip direction to right) disjunctive, symmetric crenulation cleavage, for multiple	
3351	observations at one locality	A-7-1 7.22
3352	Inclined (dip direction to right) disjunctive, symmetric crenulation foliation, for multiple	
3353	observations at one locality	A-8-4 8.3.31
3354	Inclined (dip direction to right) eutaxitic foliation, for multiple observations at one locality.....	A-8-2 8.2.22
3355	Inclined (dip direction to right) flow banding, lamination, or foliation in igneous rock, for multiple	
3356	observations at one locality	A-8-1 8.2.5
3357	Inclined (dip direction to right) generic (origin not known or not specified) foliation, for multiple	
3358	observations at one locality	A-8-1 8.1.4
3359	Inclined (dip direction to right) gneissic layering, for multiple observations at one locality.....	A-8-5 8.3.49
3360	Inclined (dip direction to right) metamorphic or tectonic foliation, for multiple observations at	
3361	one locality	A-8-3 8.3.4
3362	Inclined (dip direction to right) mylonitic foliation, for multiple observations at one locality	A-8-5 8.3.58
3363	Inclined disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation	
3364	cleavage.....	A-7-2 7.26
3365	Inclined disjunctive, asymmetric (S-shaped, counterclockwise sense of shear) crenulation	
3366	foliation	A-8-4 8.3.35
3367	Inclined disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation cleavage.....	A-7-2 7.32
3368	Inclined disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation foliation.....	A-8-4 8.3.41
3369	Inclined disjunctive, spaced cleavage.....	A-7-1 7.14
3370	Inclined disjunctive, spaced foliation	A-8-4 8.3.23
3371	Inclined disjunctive, symmetric crenulation cleavage	A-7-1 7.20
3372	Inclined disjunctive, symmetric crenulation foliation	A-8-4 8.3.29
3373	Inclined drill hole for hydrocarbon exploration or exploitation, showing angle of inclination	A-19-6 19.5.15
3374	Inclined drill hole for hydrocarbon exploration or exploitation, showing location of collar and	
3375	projected trace and bottom of drill hole	A-19-6 19.5.14
3376	Inclined drill hole for hydrocarbon exploration or exploitation, showing surface altitude of collar	A-19-6 19.5.16
3377	Inclined drill hole for hydrocarbon exploration or exploitation, showing total depth of drill hole.....	A-19-6 19.5.17
3378	Inclined drill hole for mineral exploration, showing angle of inclination.....	A-19-4 19.3.32
3379	Inclined drill hole for mineral exploration, showing location of collar and projected trace and	
3380	bottom of drill hole.....	A-19-4 19.3.31
3381	Inclined drill hole for mineral exploration, showing surface altitude of collar.....	A-19-4 19.3.33
3382	Inclined drill hole for mineral exploration, showing total depth of drill hole	A-19-4 19.3.34
3383	Inclined eutaxitic foliation.....	A-8-2 8.2.20
3384	Inclined fault (1st option).....	A-2-11 2.11.8
3385	Inclined fault (2nd option).....	A-2-11 2.11.9
3386	Inclined flow banding in igneous rock.....	A-8-1 8.2.3
3387	Inclined flute mark in sedimentary materials (1st option)	A-9-1 9.13
3388	Inclined flute mark in sedimentary materials (2nd option)	A-9-1 9.14

	<i>Page</i>	<i>Ref. No.</i>
3389		
3390 Inclined fold hinge of generic (type or orientation unspecified) small, minor fold (1st option)	A-9-5	9.97
3391 Inclined fold hinge of generic (type or orientation unspecified) small, minor fold (2nd option)	A-9-5	9.98
3392 Inclined fold hinge of small, minor anticline (1st option)	A-9-5	9.105
3393 Inclined fold hinge of small, minor anticline (2nd option)	A-9-5	9.106
3394 Inclined fold hinge of small, minor antiform (1st option)	A-9-5	9.109
3395 Inclined fold hinge of small, minor antiform (2nd option)	A-9-5	9.110
3396 Inclined fold hinge of small, minor penecontemporaneous soft-sediment fold (1st option)	A-9-5	9.101
3397 Inclined fold hinge of small, minor penecontemporaneous soft-sediment fold (2nd option)	A-9-5	9.102
3398 Inclined fold hinge of small, minor syncline (1st option)	A-9-5	9.113
3399 Inclined fold hinge of small, minor syncline (2nd option)	A-9-5	9.114
3400 Inclined fold hinge of small, minor synform (1st option)	A-9-5	9.117
3401 Inclined fold hinge of small, minor synform (2nd option)	A-9-5	9.118
3402 Inclined foliation in igneous rock	A-8-1	8.2.3
3403 Inclined generic (origin not known or not specified) foliation	A-8-1	8.1.2
3404 Inclined generic (origin or type not known or not specified) lineation or linear structure (1st		
3405 option)	A-9-1	9.3
3406 Inclined generic (origin or type not known or not specified) lineation or linear structure (2nd		
3407 option)	A-9-1	9.4
3408 Inclined gneissic layering	A-8-5	8.3.47
3409 Inclined graded bedding	A-6-2	6.27
3410 Inclined groove in sedimentary materials (1st option)	A-9-1	9.13
3411 Inclined groove in sedimentary materials (2nd option)	A-9-1	9.14
3412 Inclined groove on fault surface (1st option)	A-9-1	9.17
3413 Inclined groove on fault surface (2nd option)	A-9-1	9.18
3414 Inclined joint (1st option)	A-4-1	4.2.3
3415 Inclined joint (2nd option)	A-4-1	4.2.4
3416 Inclined key bed (1st option)	A-1-6	1.4.1
3417 Inclined key bed (2nd option)	A-1-6	1.4.2
3418 Inclined lamination in igneous rock	A-8-1	8.2.3
3419 Inclined lineation at intersection of bedding and cleavage (1st option)	A-9-4	9.77
3420 Inclined lineation at intersection of bedding and cleavage (2nd option)	A-9-4	9.78
3421 Inclined lineation at intersection of two cleavages (1st option)	A-9-4	9.81
3422 Inclined lineation at intersection of two cleavages (2nd option)	A-9-4	9.82
3423 Inclined lineation at intersection of two foliations (1st option)	A-9-4	9.89
3424 Inclined lineation at intersection of two foliations (2nd option)	A-9-4	9.90
3425 Inclined lineation at intersection of two fractures or joints (1st option)	A-9-4	9.85
3426 Inclined lineation at intersection of two fractures or joints (2nd option)	A-9-4	9.86
3427 Inclined lineation at intersection of two surfaces (origin or type unspecified) (1st option)	A-9-4	9.93
3428 Inclined lineation at intersection of two surfaces (origin or type unspecified) (2nd option)	A-9-4	9.94
3429 Inclined metamorphic foliation	A-8-3	8.3.2

	<i>Page</i>	<i>Ref. No.</i>
3430		
3431 Inclined metamorphic foliation parallel to bedding.....	A-8-3	8.3.8
3432 Inclined metamorphic foliation parallel to overturned bedding.....	A-8-3	8.3.10
3433 Inclined metamorphic foliation parallel to overturned bedding, where top direction of beds is		
3434 known from local features.....	A-8-3	8.3.13
3435 Inclined metamorphic foliation parallel to upright bedding, where top direction of beds is known		
3436 from local features.....	A-8-3	8.3.11
3437 Inclined mine shaft, as shown on smaller scale or general-purpose maps, showing angle of		
3438 inclination.....	A-19-4	19.3.39
3439 Inclined mine shaft, as shown on smaller scale or general-purpose maps, showing direction of		
3440 inclination.....	A-19-4	19.3.38
3441 Inclined mine shaft at surface (drawn to scale), as shown on subsurface exploration maps,		
3442 showing angle of inclination.....	A-19-5	19.4.3
3443 Inclined mine shaft at surface (drawn to scale), as shown on subsurface exploration maps,		
3444 showing direction of inclination.....	A-19-5	19.4.2
3445 Inclined mineralized stringer (1st option).....	A-19-1	19.1.8
3446 Inclined mineralized stringer (2nd option).....	A-19-1	19.1.9
3447 Inclined mullions (1st option).....	A-9-3	9.65
3448 Inclined mullions (2nd option).....	A-9-3	9.66
3449 Inclined mylonitic foliation.....	A-8-5	8.3.56
3450 Inclined parting lineation in sedimentary materials (1st option).....	A-9-1	9.9
3451 Inclined parting lineation in sedimentary materials (2nd option).....	A-9-1	9.10
3452 Inclined pencil structure (1st option).....	A-9-4	9.73
3453 Inclined pencil structure (2nd option).....	A-9-4	9.74
3454 Inclined rodding (1st option).....	A-9-3	9.61
3455 Inclined rodding (2nd option).....	A-9-3	9.62
3456 Inclined scour mark in sedimentary materials (1st option).....	A-9-1	9.13
3457 Inclined scour mark in sedimentary materials (2nd option).....	A-9-1	9.14
3458 Inclined slickenline on fault surface (1st option).....	A-9-1	9.17
3459 Inclined slickenline on fault surface (2nd option).....	A-9-1	9.18
3460 Inclined sole mark in sedimentary materials (1st option).....	A-9-1	9.13
3461 Inclined sole mark in sedimentary materials (2nd option).....	A-9-1	9.14
3462 Inclined striation (origin not known or not specified) (1st option).....	A-9-1	9.21
3463 Inclined striation (origin not known or not specified) (2nd option).....	A-9-1	9.22
3464 Inclined striation on fault surface (1st option).....	A-9-1	9.17
3465 Inclined striation on fault surface (2nd option).....	A-9-1	9.18
3466 Inclined surface groove (origin not known or not specified) (1st option).....	A-9-1	9.21
3467 Inclined surface groove (origin not known or not specified) (2nd option).....	A-9-1	9.22
3468 Inclined symmetric minor fold hinge (1st option).....	A-9-6	9.121
3469 Inclined symmetric minor fold hinge (2nd option).....	A-9-6	9.122
3470 Inclined tectonic foliation.....	A-8-3	8.3.2

	<i>Page</i>	<i>Ref. No.</i>
3471		
3472	Inclined tectonic foliation parallel to bedding	A-8-3 8.3.8
3473	Inclined tectonic foliation parallel to overturned bedding	A-8-3 8.3.10
3474	Inclined tectonic foliation parallel to overturned bedding, where top direction of beds is known	
3475	from local features.....	A-8-3 8.3.13
3476	Inclined tectonic foliation parallel to upright bedding, where top direction of beds is known from	
3477	local features	A-8-3 8.3.11
3478	Inclined tool mark in sedimentary materials (1st option)	A-9-1 9.13
3479	Inclined tool mark in sedimentary materials (2nd option)	A-9-1 9.14
3480	Inclined undulatory bedding	A-6-2 6.25
3481	Inclined undulatory gneissic layering.....	A-8-5 8.3.53
3482	Inclined vein (1st option).....	A-19-1 19.1.8
3483	Inclined vein (2nd option).....	A-19-1 19.1.9
3484	Inclined veinlet (1st option).....	A-19-1 19.1.8
3485	Inclined veinlet (2nd option).....	A-19-1 19.1.9
3486	Inclined warped bedding.....	A-6-2 6.25
3487	Inclined workings, as shown on subsurface exploration maps (drawn to scale)	A-19-5 19.4.12
3488	Incorporated borough boundary	A-29-1 29.5
3489	Incorporated city boundary.....	A-29-1 29.5
3490	Incorporated hamlet boundary	A-29-1 29.5
3491	Incorporated town boundary	A-29-1 29.5
3492	Incorporated village boundary	A-29-1 29.5
3493	Indefinite shoreline.....	A-30-5 30.2.30
3494	Index bathymetric contour.....	A-30-2 30.1.27
3495	Index bathymetric contour—Approximate.....	A-30-2 30.1.28
3496	Index bathymetric depression contour.....	A-30-2 30.1.37
3497	Index bathymetric rise contour (inside depression).....	A-30-2 30.1.38
3498	Index contour on glacier or permanent snowfield.....	A-30-3 30.1.45
3499	Index contour on glacier or permanent snowfield—Approximate or indefinite	A-30-3 30.1.46
3500	Index depression contour on glacier or permanent snowfield	A-30-3 30.1.49
3501	Index primary bathymetric contour	A-30-2 30.1.21
3502	Index primary bathymetric contour—Approximate	A-30-2 30.1.22
3503	Index primary bathymetric depression contour.....	A-30-2 30.1.31
3504	Index primary bathymetric rise contour (inside depression).....	A-30-2 30.1.32
3505	Index topographic contour (1st option).....	A-30-1 30.1.1
3506	Index topographic contour (1st option)—Approximate or indefinite.....	A-30-1 30.1.2
3507	Index topographic contour (2nd option).....	A-30-1 30.1.11
3508	Index topographic contour (2nd option)—Approximate or indefinite.....	A-30-1 30.1.12
3509	Index topographic depression contour (1st option)	A-30-1 30.1.7
3510	Index topographic depression contour (2nd option)	A-30-1 30.1.17
3511	Indiana [state location map].....	A-34-1 Sec. 34.1

	<i>Page</i>	<i>Ref. No.</i>
3512		
3513	Induced polarization survey A-3-1	Sec. 3
3514	"Inferred" [concepts and definitions] 27	n/a
3515	Inferred glacial-lake spillway A-13-1	13.5
3516	Inferred glacial-lake spillway, showing estimated elevation A-13-1	13.6
3517	Inferred stoped area (drawn to scale), as shown on subsurface exploration maps (section view) A-19-5	19.4.18
3518	Infiltration gallery A-26-9	26.7.7
3519	Informational geologic point data [concepts and definitions] 20	n/a
3520	Insects A-10-1	10.2.7
3521	Interbedded calcareous shale and limestone (shale dominant) A-37-2	675
3522	Interbedded limestone and calcareous shale A-37-2	680
3523	Interbedded limestone and shale (1st option) A-37-2	677
3524	Interbedded limestone and shale (2nd option) A-37-2	678
3525	Interbedded limestone and shale (limestone dominant) A-37-2	679
3526	Interbedded ripple-bedded sandstone and shale A-37-2	671
3527	Interbedded sandstone and shale A-37-2	670
3528	Interbedded sandstone and siltstone A-37-2	669
3529	Interbedded shale and limestone (shale dominant) (1st option) A-37-2	673
3530	Interbedded shale and limestone (shale dominant) (2nd option) A-37-2	674
3531	Interbedded shale and silty limestone (shale dominant) A-37-2	672
3532	Interbedded silty limestone and shale A-37-2	676
3533	Intermediate bathymetric contour A-30-2	30.1.29
3534	Intermediate bathymetric contour—Approximate A-30-2	30.1.30
3535	Intermediate bathymetric depression contour A-30-2	30.1.39
3536	Intermediate bathymetric rise contour (inside depression) A-30-2	30.1.40
3537	Intermediate contour on glacier or permanent snowfield A-30-3	30.1.47
3538	Intermediate contour on glacier or permanent snowfield—Approximate or indefinite A-30-3	30.1.48
3539	Intermediate depression contour on glacier or permanent snowfield—Approximate or indefinite A-30-3	30.1.50
3540	Intermediate topographic contour (1st option) A-30-1	30.1.3
3541	Intermediate topographic contour (1st option)—Approximate or indefinite A-30-1	30.1.4
3542	Intermediate topographic contour (2nd option) A-30-1	30.1.13
3543	Intermediate topographic contour (2nd option)—Approximate or indefinite A-30-1	30.1.14
3544	Intermediate topographic depression contour (1st option) A-30-1	30.1.8
3545	Intermediate topographic depression contour (2nd option) A-30-1	30.1.18
3546	Intermittent creek (double-line drainage) A-30-4	30.2.5
3547	Intermittent creek (single-line drainage) A-30-4	30.2.2
3548	Intermittent lake A-30-5	30.2.33
3549	Intermittent pond A-30-5	30.2.33
3550	Intermittent river (double-line drainage) A-30-4	30.2.5
3551	Intermittent river (single-line drainage) A-30-4	30.2.2
3552	Intermittent stream (double-line drainage) A-30-4	30.2.5

	<i>Page</i>	<i>Ref. No.</i>
3553		
3554	Intermittent stream (single-line drainage)..... A-30-4	30.2.2
3555	Intermittent wash (double-line drainage)..... A-30-4	30.2.5
3556	Intermittent wash (single-line drainage)..... A-30-4	30.2.2
3557	Internal contact—Identity and existence certain, location accurate A-1-1	1.1.9
3558	Internal contact—Identity and existence certain, location approximate A-1-1	1.1.11
3559	Internal contact—Identity and existence certain, location concealed A-1-1	1.1.15
3560	Internal contact—Identity and existence certain, location inferred..... A-1-1	1.1.13
3561	Internal contact—Identity or existence questionable, location accurate A-1-1	1.1.10
3562	Internal contact—Identity or existence questionable, location approximate A-1-1	1.1.12
3563	Internal contact—Identity or existence questionable, location concealed A-1-1	1.1.16
3564	Internal contact—Identity or existence questionable, location inferred..... A-1-1	1.1.14
3565	Internal scarp in landslide—Active, sharp, distinct, and accurately located..... A-17-1	17.16
3566	Internal scarp in landslide—Inactive, subdued, indistinct, and (or) approximately located..... A-17-1	17.17
3567	Internal scarp in landslide, showing height A-17-1	17.18
3568	Internal scarp of rotated block in landslide..... A-17-1	17.19
3569	Internal thrust fault in landslide—Active, sharp, distinct, and accurately located..... A-17-2	17.22
3570	Internal thrust fault in landslide—Inactive, subdued, indistinct, and (or) approximately located A-17-2	17.23
3571	Internal thrust fault in landslide, showing transport reversal—Active, sharp, distinct, and	
3572	accurately located..... A-17-2	17.24
3573	Internal thrust fault in landslide, showing transport reversal—Inactive, subdued, indistinct, and	
3574	(or) approximately located A-17-2	17.25
3575	Intersection lineation A-9-4	Sec. 9
3576	Intersection of workings (drawn to scale), as shown on subsurface exploration maps..... A-19-5	19.4.9
3577	Interstate route marker A-28-1	28.16
3578	Introductory materials [of this standard] 1	n/a
3579	Inundated land A-30-5	30.2.35
3580	Invertebrates..... A-10-1	10.2.2
3581	Inverted anticline (1st option)—Identity and existence certain, location accurate A-5-4	5.3.33
3582	Inverted anticline (1st option)—Identity and existence certain, location approximate A-5-4	5.3.35
3583	Inverted anticline (1st option)—Identity and existence certain, location concealed A-5-4	5.3.39
3584	Inverted anticline (1st option)—Identity and existence certain, location inferred..... A-5-4	5.3.37
3585	Inverted anticline (1st option)—Identity or existence questionable, location accurate A-5-4	5.3.34
3586	Inverted anticline (1st option)—Identity or existence questionable, location approximate A-5-4	5.3.36
3587	Inverted anticline (1st option)—Identity or existence questionable, location concealed A-5-4	5.3.40
3588	Inverted anticline (1st option)—Identity or existence questionable, location inferred..... A-5-4	5.3.38
3589	Inverted anticline (2nd option)—Identity and existence certain, location accurate A-5-4	5.3.41
3590	Inverted anticline (2nd option)—Identity and existence certain, location approximate A-5-4	5.3.43
3591	Inverted anticline (2nd option)—Identity and existence certain, location concealed A-5-4	5.3.47
3592	Inverted anticline (2nd option)—Identity and existence certain, location inferred..... A-5-4	5.3.45
3593	Inverted anticline (2nd option)—Identity or existence questionable, location accurate A-5-4	5.3.42

	<i>Page</i>	<i>Ref. No.</i>
3594		
3595	Inverted anticline (2nd option)—Identity or existence questionable, location approximate	A-5-4 5.3.44
3596	Inverted anticline (2nd option)—Identity or existence questionable, location concealed	A-5-4 5.3.48
3597	Inverted anticline (2nd option)—Identity or existence questionable, location inferred	A-5-4 5.3.46
3598	Inverted anticlines	A-5-3 Sec. 5.3
3599	Inverted syncline (1st option)—Identity and existence certain, location accurate	A-5-9 5.7.33
3600	Inverted syncline (1st option)—Identity and existence certain, location approximate	A-5-9 5.7.35
3601	Inverted syncline (1st option)—Identity and existence certain, location concealed	A-5-9 5.7.39
3602	Inverted syncline (1st option)—Identity and existence certain, location inferred	A-5-9 5.7.37
3603	Inverted syncline (1st option)—Identity or existence questionable, location accurate	A-5-9 5.7.34
3604	Inverted syncline (1st option)—Identity or existence questionable, location approximate	A-5-9 5.7.36
3605	Inverted syncline (1st option)—Identity or existence questionable, location concealed	A-5-9 5.7.40
3606	Inverted syncline (1st option)—Identity or existence questionable, location inferred	A-5-9 5.7.38
3607	Inverted syncline (2nd option)—Identity and existence certain, location accurate	A-5-9 5.7.41
3608	Inverted syncline (2nd option)—Identity and existence certain, location approximate	A-5-9 5.7.43
3609	Inverted syncline (2nd option)—Identity and existence certain, location concealed	A-5-9 5.7.47
3610	Inverted syncline (2nd option)—Identity and existence certain, location inferred	A-5-9 5.7.45
3611	Inverted syncline (2nd option)—Identity or existence questionable, location accurate	A-5-9 5.7.42
3612	Inverted syncline (2nd option)—Identity or existence questionable, location approximate	A-5-9 5.7.44
3613	Inverted syncline (2nd option)—Identity or existence questionable, location concealed	A-5-9 5.7.48
3614	Inverted syncline (2nd option)—Identity or existence questionable, location inferred	A-5-9 5.7.46
3615	Inverted synclines	A-5-8 Sec. 5.7
3616	Iowa [state location map]	A-34-1 Sec. 34.1
3617	Irregularly bedded limestone	A-37-1 630
3618		
3619	Joint—Identity and existence certain, location accurate	A-4-1 4.2.1
3620	Joint—Identity and existence certain, location approximate	A-4-1 4.2.2
3621	Joint or fracture pattern, planetary	A-25-6 25.124
3622	Joints	A-4-1 Sec. 4.2
3623	Judicial division boundary	A-29-1 29.3
3624	Junked hole (nonspecific depth)	A-19-7 19.5.23
3625	Jurassic [geologic age symbol]	A-32-1 32.8
3626		
3627	K [abbreviation]	A-v Table 2
3628	Kansas [state location map]	A-34-1 Sec. 34.1
3629	Kentucky [state location map]	A-34-1 Sec. 34.1
3630	Kettle	A-13-2 13.25
3631	Key bed—Identity and existence certain, location accurate	A-1-3 1.2.1
3632	Key bed—Identity and existence certain, location approximate	A-1-3 1.2.3
3633	Key bed—Identity and existence certain, location concealed	A-1-3 1.2.7
3634	Key bed—Identity and existence certain, location inferred	A-1-3 1.2.5

	<i>Page</i>	<i>Ref. No.</i>
3635		
3636 Key bed—Identity or existence questionable, location accurate	A-1-3	1.2.2
3637 Key bed—Identity or existence questionable, location approximate	A-1-3	1.2.4
3638 Key bed—Identity or existence questionable, location concealed	A-1-3	1.2.8
3639 Key bed—Identity or existence questionable, location inferred	A-1-3	1.2.6
3640 Key bed line-symbol decorations	A-1-6	Sec. 1.4
3641 Key bed notations	A-1-6	Sec. 1.4
3642 Key bed outcrop area (1st option)	A-1-4	1.2.42
3643 Key bed outcrop area (2nd option)	A-1-4	1.2.43
3644 Key bed showing name	A-1-6	1.4.12
3645 Key beds	A-1-3	Sec. 1.2
3646 Key beds [concepts and definitions]	14	n/a
3647 Kink-band crenulation lineation	A-9-6	Sec. 9
3648 Knob, planetary (mapped to scale), showing apical fissure	A-25-4	25.83
3649 Knob, planetary (not mapped to scale)	A-25-4	25.82
3650		
3651 Label placement guidelines	39	n/a
3652 Labels [concepts and definitions]	12	n/a
3653 Labels on geologic maps [concepts and definitions]	10	n/a
3654 Lacustrine features	A-15-1	Sec. 15
3655 Lagging along drift (drawn to scale), as shown on subsurface exploration maps	A-19-5	19.4.14
3656 Lakes	A-30-5	Sec. 30.2
3657 Lamination in igneous rock	A-8-1	Sec. 8.2
3658 Land subject to inundation	A-30-5	30.2.35
3659 Landmark object, as shown on topographic maps or on general-purpose or smaller scale maps	A-30-6	30.3.7
3660 Landslide deposits, showing direction of downslope movement	A-17-1	17.11
3661 Landslide features	A-17-1	Sec. 17
3662 Landslide scarp	A-17-1	Sec. 17
3663 Landslide toe	A-17-2	Sec. 17
3664 Large cinder cone	A-18-3	18.56
3665 Large cone	A-18-3	18.56
3666 Large cone, planetary (mapped to scale)	A-25-4	25.81
3667 Large depression, planetary (mapped to scale)	A-25-3	25.54
3668 Large dome, planetary (mapped to scale)	A-25-4	25.80
3669 Large edifice, planetary (not mapped to scale)	A-25-4	25.87
3670 Large endogenic crater, planetary (mapped to scale)	A-25-5	25.109
3671 Large hornito	A-18-3	18.58
3672 Large shield, planetary (mapped to scale)	A-25-4	25.80
3673 Large spatter cone	A-18-3	18.56
3674 Large, steep-sided dome, planetary (not mapped to scale)	A-25-4	25.78
3675 Large, steep-sided shield, planetary (not mapped to scale)	A-25-4	25.78

	<i>Page</i>	<i>Ref. No.</i>
3676		
3677	Large, steep-sided volcanic construct, planetary (not mapped to scale)	A-25-4 25.78
3678	Large vent	A-18-3 18.56
3679	Large volcanic construct, planetary (mapped to scale)	A-25-4 25.80
3680	Larger foraminifera	A-10-1 10.2.49
3681	Late Archean [geologic age symbol]	A-32-2 32.31
3682	Late Early Proterozoic [geologic age symbol]	A-32-2 32.27
3683	Late Middle Proterozoic [geologic age symbol]	A-32-1 32.23
3684	Late Proterozoic [geologic age symbol]	A-32-1 32.21
3685	Late Quaternary displacement	A-2-16 2.13.3
3686	Lateral levee crest on landslide (1st option)	A-17-3 17.44
3687	Lateral levee crest on landslide (2nd option)	A-17-3 17.45
3688	Latitude tick and value	A-31-1 31.9
3689	Lava-flow front—Identity and existence certain, location accurate	A-18-2 18.32
3690	Lava-flow front—Identity and existence certain, location approximate	A-18-2 18.34
3691	Lava-flow front—Identity and existence certain, location concealed	A-18-2 18.36
3692	Lava-flow front—Identity or existence questionable, location accurate	A-18-2 18.33
3693	Lava-flow front—Identity or existence questionable, location approximate	A-18-2 18.35
3694	Lava-flow front—Identity or existence questionable, location concealed	A-18-2 18.37
3695	Lava pond	A-18-3 18.54
3696	Lava tube, showing collapses (mapped to scale) along lava tube	A-18-2 18.45
3697	Lava tube, showing skylights (not mapped to scale) along lava tube	A-18-2 18.44
3698	Layer, planetary	A-25-3 25.62
3699	Layering in canyon wall, planetary	A-25-3 25.64
3700	Leader	A-31-1 31.11
3701	Leader placement guidelines	39 n/a
3702	Leaves	A-10-1 10.2.32
3703	Left flank of landslide—Active, sharp, distinct, and accurately located	A-17-2 17.30
3704	Left flank of landslide—Concealed by landslide deposits or debris materials	A-17-2 17.32
3705	Left flank of landslide—Inactive, subdued, indistinct, and (or) approximately located	A-17-2 17.31
3706	Left flank of landslide, showing amount of offset	A-17-2 17.33
3707	Left-lateral oblique-slip faults	A-2-6 Sec. 2.7
3708	Left-lateral shear feature in landslide—Active, sharp, distinct, and accurately located	A-17-2 17.30
3709	Left-lateral shear feature in landslide—Concealed by landslide deposits or debris materials	A-17-2 17.32
3710	Left-lateral shear feature in landslide—Inactive, subdued, indistinct, and (or) approximately	
3711	located	A-17-2 17.31
3712	Left-lateral shear feature in landslide, showing amount of offset	A-17-2 17.33
3713	Left-lateral strike-slip faults	A-2-5 Sec. 2.6
3714	Length specifications [in this standard]	40 n/a
3715	Levels of locational accuracy [concepts and definitions]	31 n/a
3716	Levels of scientific confidence [concepts and definitions]	23 n/a

	<i>Page</i>	<i>Ref. No.</i>
3717		
3718	Light-colored ejecta, planetary A-25-6	25.119
3719	Light-duty road, dirt (Class 3) A-28-1	28.11
3720	Light-duty road, gravel (Class 3) A-28-1	28.10
3721	Light-duty road, paved (Class 3) A-28-1	28.9
3722	Limestone A-37-1	627
3723	Limestone, irregular (burrow?) fillings of saccharoidal dolomite A-37-1	631
3724	Limit of glacier A-13-3	Sec. 13
3725	Limit of significant glacial advance—Identity and existence certain, location accurate A-13-3	13.58
3726	Limit of significant glacial advance—Identity and existence certain, location approximate A-13-3	13.60
3727	Limit of significant glacial advance—Identity and existence certain, location concealed A-13-3	13.62
3728	Limit of significant glacial advance—Identity or existence questionable, location accurate A-13-3	13.59
3729	Limit of significant glacial advance—Identity or existence questionable, location approximate A-13-3	13.61
3730	Limit of significant glacial advance—Identity or existence questionable, location concealed A-13-3	13.63
3731	Limit of subsidence caused by shock—Identity and existence certain, location accurate A-21-1	21.16
3732	Limit of subsidence caused by shock—Identity and existence certain, location concealed A-21-1	21.22
3733	Limit of subsidence caused by shock—Identity or existence certain, location approximate A-21-1	21.18
3734	Limit of subsidence caused by shock—Identity or existence certain, location inferred A-21-1	21.20
3735	Limit of subsidence caused by shock—Identity or existence questionable, location accurate A-21-1	21.17
3736	Limit of subsidence caused by shock—Identity or existence questionable, location	
3737	approximate A-21-1	21.19
3738	Limit of subsidence caused by shock—Identity or existence questionable, location concealed A-21-1	21.23
3739	Limit of subsidence caused by shock—Identity or existence questionable, location inferred A-21-1	21.21
3740	Limonite A-37-2	664
3741	Limy dolomite A-37-1	641
3742	Limy dolostone A-37-1	641
3743	Line of average annual, monthly, or daily (etc.) precipitation [date]—Accurately located A-26-8	26.6.1
3744	Line of average annual, monthly, or daily (etc.) precipitation [date]—Approximately located A-26-8	26.6.2
3745	Line of equal annual, monthly, or daily (etc.) precipitation [date]—Accurately located A-26-8	26.6.1
3746	Line of equal annual, monthly, or daily (etc.) precipitation [date]—Approximately located A-26-8	26.6.2
3747	Line of equal chemical-constituent concentration [date]—Accurately located A-26-8	26.6.11
3748	Line of equal chemical-constituent concentration [date]—Approximately located A-26-8	26.6.12
3749	Line of equal depth to aquifer [date]—Accurately located A-26-8	26.6.3
3750	Line of equal depth to aquifer [date]—Approximately located A-26-8	26.6.4
3751	Line of equal depth to bedrock [date]—Accurately located A-26-8	26.6.3
3752	Line of equal depth to bedrock [date]—Approximately located A-26-8	26.6.4
3753	Line of equal depth to geologic formation [date]—Accurately located A-26-8	26.6.3
3754	Line of equal depth to geologic formation [date]—Approximately located A-26-8	26.6.4
3755	Line of equal depth to water [date]—Accurately located A-26-8	26.6.3
3756	Line of equal depth to water [date]—Approximately located A-26-8	26.6.4
3757	Line of equal dissolved-solids concentration [date]—Accurately located A-26-8	26.6.11

	<i>Page</i>	<i>Ref. No.</i>
3758		
3759	Line of equal dissolved-solids concentration [date]—Approximately located.....	A-26-8 26.6.12
3760	Line of equal hardness [date]—Accurately located.....	A-26-8 26.6.11
3761	Line of equal hardness [date]—Approximately located.....	A-26-8 26.6.12
3762	Line of equal hydraulic conductivity—Accurately located.....	A-26-8 26.6.17
3763	Line of equal hydraulic conductivity—Approximately located.....	A-26-8 26.6.18
3764	Line of equal porosity—Accurately located.....	A-26-8 26.6.17
3765	Line of equal porosity—Approximately located.....	A-26-8 26.6.18
3766	Line of equal runoff [date]—Accurately located.....	A-26-8 26.6.15
3767	Line of equal runoff [date]—Approximately located.....	A-26-8 26.6.16
3768	Line of equal specific conductance [date]—Accurately located.....	A-26-8 26.6.9
3769	Line of equal specific conductance [date]—Approximately located.....	A-26-8 26.6.10
3770	Line of equal thickness of aquifer [date]—Accurately located.....	A-26-8 26.6.5
3771	Line of equal thickness of aquifer [date]—Approximately located.....	A-26-8 26.6.6
3772	Line of equal thickness of confining bed [date]—Accurately located.....	A-26-8 26.6.5
3773	Line of equal thickness of confining bed [date]—Approximately located.....	A-26-8 26.6.6
3774	Line of equal thickness of geologic formation [date]—Accurately located.....	A-26-8 26.6.5
3775	Line of equal thickness of geologic formation [date]—Approximately located.....	A-26-8 26.6.6
3776	Line of equal thickness of saturated material [date]—Accurately located.....	A-26-8 26.6.5
3777	Line of equal thickness of saturated material [date]—Approximately located.....	A-26-8 26.6.6
3778	Line of equal transmissivity—Accurately located.....	A-26-8 26.6.17
3779	Line of equal transmissivity—Approximately located.....	A-26-8 26.6.18
3780	Line of equal water-level change [date]—Accurately located.....	A-26-8 26.6.13
3781	Line of equal water-level change [date]—Approximately located.....	A-26-8 26.6.14
3782	Line of equal water-level decline [date]—Accurately located.....	A-26-8 26.6.13
3783	Line of equal water-level decline [date]—Approximately located.....	A-26-8 26.6.14
3784	Line of equal water-level rise [date]—Accurately located.....	A-26-8 26.6.13
3785	Line of equal water-level rise [date]—Approximately located.....	A-26-8 26.6.14
3786	Line of equal water temperature [date]—Accurately located.....	A-26-8 26.6.7
3787	Line of equal water temperature [date]—Approximately located.....	A-26-8 26.6.8
3788	Line of mean annual, monthly, or daily (etc.) precipitation [date]—Accurately located.....	A-26-8 26.6.1
3789	Line of mean annual, monthly, or daily (etc.) precipitation [date]—Approximately located.....	A-26-8 26.6.2
3790	Line of median annual, monthly, or daily (etc.) precipitation [date]—Accurately located.....	A-26-8 26.6.1
3791	Line of median annual, monthly, or daily (etc.) precipitation [date]—Approximately located.....	A-26-8 26.6.2
3792	Line-symbol decorations [concepts and definitions].....	21 n/a
3793	Line-symbol decorations and notations for faults.....	A-2-11 Sec. 2.11
3794	Line-symbol decorations for contacts.....	A-1-6 Sec. 1.4
3795	Line-symbol decorations for dikes.....	A-1-6 Sec. 1.4
3796	Line-symbol decorations for folds.....	A-5-13 Sec. 5.10
3797	Line-symbol decorations for key beds.....	A-1-6 Sec. 1.4
3798	Line symbol styles and associated terminology.....	25 Fig. 2

	<i>Page</i>	<i>Ref. No.</i>
3799		
3800	Line symbols for linear geologic features [concepts and definitions]	18 n/a
3801	Lineament.....	A-4-1 4.1.1
3802	Lineament, planetary	A-25-3 25.63
3803	Lineament showing name	A-4-1 4.1.2
3804	Lineaments	A-4-1 Sec. 4.1
3805	Linear-feature geologic point data [concepts and definitions].....	19 n/a
3806	Linear geologic features [concepts and definitions]	17 n/a
3807	Lineation.....	A-9-1 Sec. 9
3808	Lineation on fault surface	A-2-11 2.11.12
3809	Lineation on inclined fault surface	A-2-11 2.11.13
3810	Lineation on surface of bed of economically important commodity	A-1-6 1.4.7
3811	Lineation on surface of clay bed.....	A-1-6 1.4.7
3812	Lineation on surface of coal bed.....	A-1-6 1.4.7
3813	Lineation on surface of contact	A-1-6 1.4.7
3814	Lineation on surface of dike.....	A-1-6 1.4.7
3815	Lineation on surface of inclined bed of economically important commodity.....	A-1-6 1.4.8
3816	Lineation on surface of inclined clay bed	A-1-6 1.4.8
3817	Lineation on surface of inclined coal bed	A-1-6 1.4.8
3818	Lineation on surface of inclined contact.....	A-1-6 1.4.8
3819	Lineation on surface of inclined dike	A-1-6 1.4.8
3820	Lineation on surface of inclined key bed.....	A-1-6 1.4.8
3821	Lineation on surface of key bed	A-1-6 1.4.7
3822	Lines in geologic map databases [concepts and definitions]	11 n/a
3823	Lines on geologic maps [concepts and definitions].....	10 n/a
3824	Lineweight specifications [in this standard]	40 n/a
3825	Listic fault at head of detachment fault (sense of slip unspecified)—Identity and existence	
3826	certain, location accurate	A-2-10 2.10.33
3827	Listic fault at head of detachment fault (sense of slip unspecified)—Identity and existence	
3828	certain, location approximate	A-2-10 2.10.35
3829	Listic fault at head of detachment fault (sense of slip unspecified)—Identity and existence	
3830	certain, location concealed	A-2-10 2.10.39
3831	Listic fault at head of detachment fault (sense of slip unspecified)—Identity and existence	
3832	certain, location inferred.....	A-2-10 2.10.37
3833	Listic fault at head of detachment fault (sense of slip unspecified)—Identity or existence	
3834	questionable, location accurate	A-2-10 2.10.34
3835	Listic fault at head of detachment fault (sense of slip unspecified)—Identity or existence	
3836	questionable, location approximate	A-2-10 2.10.36
3837	Listic fault at head of detachment fault (sense of slip unspecified)—Identity or existence	
3838	questionable, location concealed	A-2-10 2.10.40
3839		

	<i>Page</i>	<i>Ref. No.</i>
3840		
3841	Listric fault at head of detachment fault (sense of slip unspecified)—Identity or existence	
3842	questionable, location inferred.....	A-2-10 2.10.38
3843	Lithologic patterns.....	A-37-1 Sec. 37
3844	Lobate scarp, planetary	A-25-4 25.72
3845	Locality-information point data [concepts and definitions].....	20 n/a
3846	Locatability [concepts and definitions]	27 n/a
3847	"Location accurate" [concepts and definitions].....	31 n/a
3848	"Location approximate" [concepts and definitions].....	31 n/a
3849	"Location concealed" [concepts and definitions].....	32 n/a
3850	"Location inferred" [concepts and definitions]	31 n/a
3851	Location where contact is particularly well exposed in field	A-1-6 1.4.10
3852	Locational accuracy [concepts and definitions]	26 n/a
3853	Locks	A-30-4 Sec. 30.2
3854	Loess (1st option).....	A-37-2 684
3855	Loess (2nd option).....	A-37-2 685
3856	Loess (3rd option)	A-37-2 686
3857	Logical steps to determine appropriate line symbol styles and associated terminology	25 Fig. 2
3858	Longitude tick and value	A-31-1 31.9
3859	Louisiana [state location map]	A-34-1 Sec. 34.1
3860	Low albedo smooth material, planetary	A-25-6 25.127
3861	Low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location	
3862	accurate	A-2-3 2.3.1
3863	Low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location	
3864	approximate	A-2-3 2.3.3
3865	Low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location	
3866	concealed	A-2-3 2.3.7
3867	Low-angle fault (unknown or unspecified sense of slip)—Identity and existence certain, location	
3868	inferred	A-2-3 2.3.5
3869	Low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable,	
3870	location accurate	A-2-3 2.3.2
3871	Low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable,	
3872	location approximate	A-2-3 2.3.4
3873	Low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable,	
3874	location concealed	A-2-3 2.3.8
3875	Low-angle fault (unknown or unspecified sense of slip)—Identity or existence questionable,	
3876	location inferred	A-2-3 2.3.6
3877	Low-angle faults (unknown or unspecified sense of slip).....	A-2-3 Sec. 2.3
3878	Low-angle normal fault—Identity and existence certain, location accurate.....	A-2-2 2.2.9
3879	Low-angle normal fault—Identity and existence certain, location approximate.....	A-2-2 2.2.11
3880	Low-angle normal fault—Identity and existence certain, location concealed.....	A-2-2 2.2.15

	<i>Page</i>	<i>Ref. No.</i>
3881		
3882	Low-angle normal fault—Identity and existence certain, location inferred	A-2-2 2.2.13
3883	Low-angle normal fault—Identity or existence questionable, location accurate.....	A-2-2 2.2.10
3884	Low-angle normal fault—Identity or existence questionable, location approximate.....	A-2-2 2.2.12
3885	Low-angle normal fault—Identity or existence questionable, location concealed.....	A-2-2 2.2.16
3886	Low-angle normal fault—Identity or existence questionable, location inferred	A-2-2 2.2.14
3887	Low-flow measurement site without a gage	A-26-5 26.3.16
3888	Low point of volcanic crater	A-18-1 18.7
3889	Low water line	A-30-5 30.2.31
3890		
3891	M [abbreviation]	A-v Table 2
3892	Macrofossils	A-10-1 10.2.1
3893	Magnetic declination arrows	A-36-1 Sec. 36
3894	Magnetic north, east of true north	A-36-1 Sec. 36.1
3895	Magnetic north, west of true north	A-36-3 Sec. 36.2
3896	Magnetotelluric survey	A-3-1 Sec. 3
3897	Main scarp of landslide—Active, sharp, distinct, and accurately located	A-17-1 17.12
3898	Main scarp of landslide—Inactive, subdued, indistinct, and (or) approximately located.....	A-17-1 17.13
3899	Main scarp of landslide, showing height	A-17-1 17.14
3900	Main scarp of rotated block in landslide.....	A-17-1 17.15
3901	Main toe of landslide—Active, sharp, distinct, and accurately located	A-17-2 17.20
3902	Main toe of landslide—Inactive, subdued, indistinct, and (or) approximately located	A-17-2 17.21
3903	Maine [state location map]	A-34-1 Sec. 34.1
3904	Maintenance authority [of this standard]	5 n/a
3905	Maintenance of this standard.....	5 n/a
3906	Mammals	A-10-1 10.2.29
3907	Mangrove area	A-30-5 30.2.47
3908	Mantling material, planetary	A-25-6 25.129
3909	Map neatline	A-31-1 31.8
3910	Map neatline, showing latitude or longitude tick and value	A-31-1 31.9
3911	Map-symbol explanation [on map sheet].....	A-iii n/a
3912	Map Symbol Standards Committee	9 n/a
3913	Map symbols [concepts and definitions]	11 n/a
3914	Map-unit label (add leader where necessary).....	A-31-1 31.12
3915	Map-unit label containing geologic age character (add leader where necessary).....	A-31-1 31.17
3916	Map-unit labels [concepts and definitions].....	12 n/a
3917	Map units [concepts and definitions]	11 n/a
3918	Mapping concepts and definitions.....	10 n/a
3919	Margin of glacially scoured basin—Identity and existence certain, location accurate.....	A-13-2 13.43
3920	Margin of glacially scoured basin—Identity and existence certain, location approximate.....	A-13-2 13.45
3921	Margin of glacially scoured basin—Identity and existence certain, location concealed.....	A-13-2 13.47

	<i>Page</i>	<i>Ref. No.</i>
3922		
3923	Margin of glacially scoured basin—Identity or existence questionable, location accurate..... A-13-2	13.44
3924	Margin of glacially scoured basin—Identity or existence questionable, location approximate..... A-13-2	13.46
3925	Margin of glacially scoured basin—Identity or existence questionable, location concealed..... A-13-2	13.48
3926	Margin of oceanic rise—Accurately located..... A-22-2	22.31
3927	Margin of oceanic rise—Approximately located..... A-22-2	22.32
3928	Marine-abrasion platform (1st option)..... A-15-1	15.3
3929	Marine-abrasion platform (2nd option)..... A-15-1	15.4
3930	Marine features	Sec. 15
3931	Marl..... A-37-1	623
3932	Marsh..... A-30-5	30.2.46
3933	Maryland [state location map]	Sec. 34.1
3934	Mass-wasting features	Sec. 17
3935	Massachusetts [state location map]	Sec. 34.1
3936	Massive igneous rock	8.2.1
3937	Massive sand	607
3938	Massive sandstone..... A-37-1	607
3939	Master detachment fault (sense of slip unspecified)—Identity and existence certain, location	
3940	accurate	2.10.25
3941	Master detachment fault (sense of slip unspecified)—Identity and existence certain, location	
3942	approximate	2.10.27
3943	Master detachment fault (sense of slip unspecified)—Identity and existence certain, location	
3944	concealed	2.10.31
3945	Master detachment fault (sense of slip unspecified)—Identity and existence certain, location	
3946	inferred..... A-2-10	2.10.29
3947	Master detachment fault (sense of slip unspecified)—Identity or existence questionable, location	
3948	accurate	2.10.26
3949	Master detachment fault (sense of slip unspecified)—Identity or existence questionable, location	
3950	approximate	2.10.28
3951	Master detachment fault (sense of slip unspecified)—Identity or existence questionable, location	
3952	concealed	2.10.32
3953	Master detachment fault (sense of slip unspecified)—Identity or existence questionable, location	
3954	inferred..... A-2-10	2.10.30
3955	Maximum intensity value within closed high or closed low..... A-11-1	11.12
3956	"May not be within zone of confidence" [concepts and definitions]	n/a
3957	Mean declination arrows..... A-36-1	Sec. 36
3958	Mean low water line..... A-30-5	30.2.31
3959	Measurement site without a gage..... A-26-5	26.3.13
3960	Measurement site without a gage, equipped with a telephone or radio	26.3.14
3961	Medium-sized endogenic crater (mapped to scale), planetary..... A-25-5	25.108
3962	Meltwater stream	13.7

	<i>Page</i>	<i>Ref. No.</i>
3963		
3964	Mesa, planetary (not mapped to scale)..... A-25-4	25.79
3965	Mesozoic [geologic age symbol] A-32-1	32.6
3966	Metamorphic core complexes..... A-23-1	Sec. 23
3967	Metamorphic facies boundary A-19-1	19.1.23
3968	Metamorphic foliation A-8-3	Sec. 8.3
3969	Metamorphic patterns (Series 400)..... Pattern Chart	n/a
3970	Metamorphic-rock lithologic patterns A-37-3	Sec. 37.2
3971	Metamorphism [lithologic pattern]..... A-37-3	701
3972	Michigan [state location map] A-34-1	Sec. 34.1
3973	Microfossils A-10-1	10.2.45
3974	Mid-oceanic ridges A-22-1	Sec. 22
3975	Middle Archean [geologic age symbol] A-32-2	32.32
3976	Middle Early Proterozoic [geologic age symbol] A-32-2	32.28
3977	Middle Middle Proterozoic [geologic age symbol] A-32-1	32.24
3978	Middle Proterozoic [geologic age symbol]..... A-32-1	32.22
3979	Millimeters (mm) to inches (in) or points (pts)..... A-iv	Table 1
3980	Mine dump (1st option)..... A-19-2	19.2.7
3981	Mine dump (2nd option)..... A-19-2	19.2.8
3982	Mine dump bench..... A-19-2	19.2.9
3983	Mine shaft, above and below level (drawn to scale), as shown on subsurface exploration maps..... A-19-5	19.4.4
3984	Mine shaft, as shown on topographic maps or on general-purpose or smaller scale maps, showing	
3985	name..... A-30-6	30.3.6
3986	Mine shafts, as shown on subsurface exploration maps..... A-19-5	Sec. 19.4
3987	Mine shafts (at surface)..... A-19-4	Sec. 19.3
3988	Mine tunnel entrance, as shown on topographic maps or on general-purpose or smaller scale	
3989	maps..... A-30-6	30.3.3
3990	Mineral exploration (at surface) A-19-3	Sec. 19.3
3991	Mineral resource areas A-19-1	Sec. 19.1
3992	Mineral spring used for domestic-water supply A-26-4	26.2.6
3993	Mineral spring used for industrial-water supply..... A-26-4	26.2.18
3994	Mineral spring used for irrigation-water supply..... A-26-4	26.2.14
3995	Mineral spring used for public-water supply A-26-4	26.2.22
3996	Mineral spring used for stock-water supply..... A-26-4	26.2.10
3997	Mineralized areas A-19-1	Sec. 19.1
3998	Mineralized rock (1st option) A-19-1	19.1.14
3999	Mineralized rock (2nd option) A-19-1	19.1.15
4000	Mineralized rock, showing high level of mineralization A-19-1	19.1.16
4001	Mineralized rock, showing low level of mineralization..... A-19-1	19.1.17
4002	Mineralized stringer—Identity and existence certain, location accurate..... A-19-1	19.1.1
4003	Mineralized stringer—Identity and existence certain, location approximate..... A-19-1	19.1.3

	<i>Page</i>	<i>Ref. No.</i>
4004		
4005	Mineralized stringer—Identity and existence certain, location concealed..... A-19-1	19.1.5
4006	Mineralized stringer—Identity or existence questionable, location accurate..... A-19-1	19.1.2
4007	Mineralized stringer—Identity or existence questionable, location approximate..... A-19-1	19.1.4
4008	Mineralized stringer—Identity or existence questionable, location concealed..... A-19-1	19.1.6
4009	Mineralized stringer, showing type of mineral occurrence A-19-1	19.1.7
4010	Mines..... A-19-5	Sec. 19.4
4011	Minimum intensity value within closed high or closed low A-11-1	11.12
4012	Mining (at surface) A-19-3	Sec. 19.3
4013	Minnesota [state location map] A-34-2	Sec. 34.1
4014	Minor faults A-2-16	Sec. 2.15
4015	Minor folds A-5-14	Sec. 5.11
4016	Minor inclined mineralized stringer..... A-19-1	19.1.12
4017	Minor inclined vein..... A-19-1	19.1.12
4018	Minor inclined veinlet..... A-19-1	19.1.12
4019	Minor joints A-4-1	Sec. 4.3
4020	Minor scarp in landslide—Active, sharp, distinct, and accurately located A-17-1	17.16
4021	Minor scarp in landslide—Inactive, subdued, indistinct, and (or) approximately located..... A-17-1	17.17
4022	Minor scarp in landslide, showing height A-17-1	17.18
4023	Minor scarp of rotated block in landslide A-17-1	17.19
4024	Minor toe in landslide—Active, sharp, distinct, and accurately located A-17-2	17.22
4025	Minor toe in landslide—Inactive, subdued, indistinct, and (or) approximately located A-17-2	17.23
4026	Minor toe in landslide, showing transport reversal—Active, sharp, distinct, and accurately	
4027	located..... A-17-2	17.24
4028	Minor toe in landslide, showing transport reversal—Inactive, subdued, indistinct, and (or)	
4029	approximately located..... A-17-2	17.25
4030	Minor vertical or near-vertical mineralized stringer A-19-1	19.1.13
4031	Minor vertical or near-vertical vein A-19-1	19.1.13
4032	Minor vertical or near-vertical veinlet A-19-1	19.1.13
4033	Miscellaneous collapse features A-23-1	Sec. 23
4034	Miscellaneous geohydrologic features..... A-26-9	Sec. 26.7
4035	Miscellaneous hydrographic features A-30-6	Sec. 30.3
4036	Miscellaneous map elements..... A-31-1	Sec. 31
4037	Miscellaneous patterns (Series 400) Pattern Chart	n/a
4038	Miscellaneous topographic features..... A-30-6	Sec. 30.3
4039	Miscellaneous uplift features..... A-23-1	Sec. 23
4040	Mississippi [state location map] A-34-2	Sec. 34.1
4041	Mississippian [geologic age symbol] A-32-1	32.14
4042	Missouri [state location map] A-34-2	Sec. 34.1
4043	Moderately inclined (between 30° and 60°) bedding, as determined remotely or from aerial	
4044	photographs..... A-6-2	6.41

	<i>Page</i>	<i>Ref. No.</i>
4045		
4046 Moderately overturned (between 30° and 60°) bedding, as determined remotely or from aerial		
4047 photographs.....	A-6-2	6.45
4048 Mollusks	A-10-1	10.2.18
4049 Monocline (1st option)—Identity and existence certain, location accurate.....	A-5-11	5.9.1
4050 Monocline (1st option)—Identity and existence certain, location approximate.....	A-5-11	5.9.3
4051 Monocline (1st option)—Identity and existence certain, location concealed.....	A-5-11	5.9.7
4052 Monocline (1st option)—Identity and existence certain, location inferred.....	A-5-11	5.9.5
4053 Monocline (1st option)—Identity or existence questionable, location accurate	A-5-11	5.9.2
4054 Monocline (1st option)—Identity or existence questionable, location approximate	A-5-11	5.9.4
4055 Monocline (1st option)—Identity or existence questionable, location concealed	A-5-11	5.9.8
4056 Monocline (1st option)—Identity or existence questionable, location inferred.....	A-5-11	5.9.6
4057 Monocline (2nd option)—Identity and existence certain, location accurate.....	A-5-11	5.9.9
4058 Monocline (2nd option)—Identity and existence certain, location approximate.....	A-5-11	5.9.11
4059 Monocline (2nd option)—Identity and existence certain, location concealed.....	A-5-11	5.9.15
4060 Monocline (2nd option)—Identity and existence certain, location inferred.....	A-5-11	5.9.13
4061 Monocline (2nd option)—Identity or existence questionable, location accurate	A-5-11	5.9.10
4062 Monocline (2nd option)—Identity or existence questionable, location approximate	A-5-11	5.9.12
4063 Monocline (2nd option)—Identity or existence questionable, location concealed	A-5-11	5.9.16
4064 Monocline (2nd option)—Identity or existence questionable, location inferred.....	A-5-11	5.9.14
4065 Monocline, anticlinal bend (1st option)—Identity and existence certain, location accurate	A-5-11	5.9.17
4066 Monocline, anticlinal bend (1st option)—Identity and existence certain, location approximate	A-5-11	5.9.19
4067 Monocline, anticlinal bend (1st option)—Identity and existence certain, location concealed	A-5-11	5.9.23
4068 Monocline, anticlinal bend (1st option)—Identity and existence certain, location inferred.....	A-5-11	5.9.21
4069 Monocline, anticlinal bend (1st option)—Identity or existence questionable, location accurate	A-5-11	5.9.18
4070 Monocline, anticlinal bend (1st option)—Identity or existence questionable, location		
4071 approximate	A-5-11	5.9.20
4072 Monocline, anticlinal bend (1st option)—Identity or existence questionable, location concealed	A-5-11	5.9.24
4073 Monocline, anticlinal bend (1st option)—Identity or existence questionable, location inferred.....	A-5-11	5.9.22
4074 Monocline, anticlinal bend (2nd option)—Identity and existence certain, location accurate	A-5-12	5.9.25
4075 Monocline, anticlinal bend (2nd option)—Identity and existence certain, location approximate	A-5-12	5.9.27
4076 Monocline, anticlinal bend (2nd option)—Identity and existence certain, location concealed	A-5-12	5.9.31
4077 Monocline, anticlinal bend (2nd option)—Identity and existence certain, location inferred.....	A-5-12	5.9.29
4078 Monocline, anticlinal bend (2nd option)—Identity or existence questionable, location accurate	A-5-12	5.9.26
4079 Monocline, anticlinal bend (2nd option)—Identity or existence questionable, location		
4080 approximate	A-5-12	5.9.28
4081 Monocline, anticlinal bend (2nd option)—Identity or existence questionable, location concealed	A-5-12	5.9.32
4082 Monocline, anticlinal bend (2nd option)—Identity or existence questionable, location inferred.....	A-5-12	5.9.30
4083 Monocline, synclinal bend (1st option)—Identity and existence certain, location accurate.....	A-5-12	5.9.33
4084 Monocline, synclinal bend (1st option)—Identity and existence certain, location approximate.....	A-5-12	5.9.35
4085 Monocline, synclinal bend (1st option)—Identity and existence certain, location concealed.....	A-5-12	5.9.39

	<i>Page</i>	<i>Ref. No.</i>
4086		
4087	Monocline, synclinal bend (1st option)—Identity and existence certain, location inferred A-5-12	5.9.37
4088	Monocline, synclinal bend (1st option)—Identity or existence questionable, location accurate A-5-12	5.9.34
4089	Monocline, synclinal bend (1st option)—Identity or existence questionable, location	
4090	approximate A-5-12	5.9.36
4091	Monocline, synclinal bend (1st option)—Identity or existence questionable, location concealed A-5-12	5.9.40
4092	Monocline, synclinal bend (1st option)—Identity or existence questionable, location inferred A-5-12	5.9.38
4093	Monocline, synclinal bend (2nd option)—Identity and existence certain, location accurate..... A-5-12	5.9.41
4094	Monocline, synclinal bend (2nd option)—Identity and existence certain, location approximate..... A-5-12	5.9.43
4095	Monocline, synclinal bend (2nd option)—Identity and existence certain, location concealed..... A-5-12	5.9.47
4096	Monocline, synclinal bend (2nd option)—Identity and existence certain, location inferred A-5-12	5.9.45
4097	Monocline, synclinal bend (2nd option)—Identity or existence questionable, location accurate A-5-12	5.9.42
4098	Monocline, synclinal bend (2nd option)—Identity or existence questionable, location	
4099	approximate A-5-12	5.9.44
4100	Monocline, synclinal bend (2nd option)—Identity or existence questionable, location concealed A-5-12	5.9.48
4101	Monocline, synclinal bend (2nd option)—Identity or existence questionable, location inferred..... A-5-12	5.9.46
4102	Monoclines A-5-11	Sec. 5.9
4103	Montana [state location map] A-34-2	Sec. 34.1
4104	Moraine crest, asymmetrical moraine..... A-13-1	13.13
4105	Moraine crest, sense of symmetry unspecified (1st option)..... A-13-1	13.10
4106	Moraine crest, sense of symmetry unspecified (2nd option)..... A-13-1	13.11
4107	Moraine crest, symmetrical moraine A-13-1	13.12
4108	Moraine ridges A-13-1	13.14
4109	Mountain (rugged), planetary, origin uncertain A-25-5	25.115
4110	Mud pot, as shown on topographic maps or on general-purpose or smaller scale maps..... A-30-6	30.3.13
4111	Mullions A-9-3	Sec. 9
4112	Multiple observations at one locality -- specialized planar-feature point symbols [concepts and	
4113	definitions]..... 19	n/a
4114	Multiple vertical mine shafts, as shown on smaller scale or general-purpose maps..... A-19-4	19.3.36
4115	Multiple wells drilled from single platform..... A-19-6	19.5.18
4116	Municipio boundary..... A-29-1	29.3
4117	Mylonite zone A-2-16	2.14.1
4118	Mylonitic foliation..... A-8-5	Sec. 8.3
4119		
4120	Name of bed of economically important commodity..... A-1-6	1.4.14
4121	Name of clay bed A-1-6	1.4.13
4122	Name of clinkered coal bed A-1-6	1.4.16
4123	Name of clinkered coal bed area A-1-6	1.4.17
4124	Name of coal bed A-1-6	1.4.15
4125	Name of depositional unit at retreatal position of stagnant ice margin..... A-13-3	13.72
4126	Name of dike A-1-6	1.4.18

	<i>Page</i>	<i>Ref. No.</i>
4127		
4128	Name of dike intruding fault (1st option)	A-1-6 1.4.20
4129	Name of dike intruding fault (2nd option)	A-1-6 1.4.21
4130	Name of dike of variable thickness	A-1-6 1.4.19
4131	Name of fault.....	A-2-11 2.11.15
4132	Name of fold	A-5-13 5.10.12
4133	Name of former marine limit.....	A-15-1 15.21
4134	Name of former shoreline	A-15-1 15.21
4135	Name of glaciation on glacial limit or terminus.....	A-13-3 13.57
4136	Name of glaciation on glacial terminus.....	A-13-3 13.57
4137	Name of key bed	A-1-6 1.4.12
4138	Name of lake	A-30-5 30.2.32
4139	Name of lineament	A-4-1 4.1.2
4140	Name of pond	A-30-5 30.2.32
4141	Names of stratigraphic ages on chronostratigraphic-zone, chronozone, or stage boundary.....	A-31-1 31.24
4142	Nannofossils.....	A-10-1 10.2.52
4143	Narrow channel (possible lava channel), planetary.....	A-25-3 25.58
4144	Narrow depression, planetary.....	A-25-3 25.52
4145	National boundary.....	A-29-1 29.1
4146	National forest boundary	A-29-1 29.6
4147	National grassland boundary.....	A-29-1 29.6
4148	National monument boundary	A-29-1 29.6
4149	National park boundary.....	A-29-1 29.6
4150	National reservation boundary.....	A-29-1 29.6
4151	National wilderness area boundary.....	A-29-1 29.6
4152	National wildlife refuge boundary	A-29-1 29.6
4153	Natural resources	A-19-1 Sec. 19
4154	Nautiloids.....	A-10-1 10.2.22
4155	Neatline	A-31-1 31.8
4156	Nebraska [state location map]	A-34-2 Sec. 34.1
4157	Neogene [geologic age symbol].....	A-32-1 32.4
4158	Neotectonic features.....	A-21-1 Sec. 21
4159	Nevada [state location map].....	A-34-2 Sec. 34.1
4160	New FGDC standard terminology.....	24 Fig. 1
4161	New Hampshire [state location map]	A-34-2 Sec. 34.1
4162	New Jersey [state location map].....	A-34-2 Sec. 34.1
4163	New Mexico [state location map]	A-34-2 Sec. 34.1
4164	New York [state location map]	A-34-2 Sec. 34.1
4165	Nodular limestone	A-37-1 630
4166	Nonflowing artesian well used for industrial-water supply.....	A-26-2 26.1.36
4167	Nonflowing artesian well used for irrigation-water supply.....	A-26-2 26.1.27

	<i>Page</i>	<i>Ref. No.</i>
4168		
4169	Nonflowing artesian well used for public-water supply..... A-26-3	26.1.45
4170	Nonflowing artesian well, used for domestic-water supply..... A-26-1	26.1.9
4171	Nonflowing artesian well, used for stock-water supply A-26-1	26.1.18
4172	Normal fault—Identity and existence certain, location accurate..... A-2-2	2.2.1
4173	Normal fault—Identity and existence certain, location approximate..... A-2-2	2.2.3
4174	Normal fault—Identity and existence certain, location concealed..... A-2-2	2.2.7
4175	Normal fault—Identity and existence certain, location inferred A-2-2	2.2.5
4176	Normal fault—Identity or existence questionable, location accurate..... A-2-2	2.2.2
4177	Normal fault—Identity or existence questionable, location approximate..... A-2-2	2.2.4
4178	Normal fault—Identity or existence questionable, location concealed..... A-2-2	2.2.8
4179	Normal fault—Identity or existence questionable, location inferred A-2-2	2.2.6
4180	Normal fault (in cross section)..... A-2-11	2.11.16
4181	Normal fault (on small-scale maps or figures)..... A-2-11	2.11.22
4182	Normal fault, planetary—Location accurate..... A-25-1	25.9
4183	Normal fault, planetary—Location approximate..... A-25-1	25.10
4184	Normal fault, planetary—Location concealed..... A-25-1	25.12
4185	Normal fault, planetary—Location inferred A-25-1	25.11
4186	Normal faults..... A-2-2	Sec. 2.2
4187	Normal-slip rotational faults A-2-4	Sec. 2.5
4188	Normal-slip scissor faults..... A-2-4	Sec. 2.5
4189	North Carolina [state location map]..... A-34-2	Sec. 34.1
4190	North Dakota [state location map] A-34-2	Sec. 34.1
4191	Notations for contacts..... A-1-6	Sec. 1.4
4192	Notations for dikes A-1-6	Sec. 1.4
4193	Notations for faults A-2-11	Sec. 2.11
4194	Notations for folds..... A-5-13	Sec. 5.10
4195	Notations for key beds A-1-6	Sec. 1.4
4196	Nova, planetary A-25-4	25.92
4197		
4198	Objective [of this standard] 1	n/a
4199	Oblique-slip fault, left-lateral offset—Identity and existence certain, location accurate A-2-6	2.7.9
4200	Oblique-slip fault, left-lateral offset—Identity and existence certain, location approximate A-2-6	2.7.11
4201	Oblique-slip fault, left-lateral offset—Identity and existence certain, location concealed A-2-6	2.7.15
4202	Oblique-slip fault, left-lateral offset—Identity and existence certain, location inferred..... A-2-6	2.7.13
4203	Oblique-slip fault, left-lateral offset—Identity or existence questionable, location accurate A-2-6	2.7.10
4204	Oblique-slip fault, left-lateral offset—Identity or existence questionable, location approximate A-2-6	2.7.12
4205	Oblique-slip fault, left-lateral offset—Identity or existence questionable, location concealed A-2-6	2.7.16
4206	Oblique-slip fault, left-lateral offset—Identity or existence questionable, location inferred..... A-2-6	2.7.14
4207	Oblique-slip fault, right-lateral offset—Identity and existence certain, location accurate..... A-2-6	2.7.1
4208	Oblique-slip fault, right-lateral offset—Identity and existence certain, location approximate..... A-2-6	2.7.3

	<i>Page</i>	<i>Ref. No.</i>
4209		
4210	Oblique-slip fault, right-lateral offset—Identity and existence certain, location concealed..... A-2-6	2.7.7
4211	Oblique-slip fault, right-lateral offset—Identity and existence certain, location inferred A-2-6	2.7.5
4212	Oblique-slip fault, right-lateral offset—Identity or existence questionable, location accurate..... A-2-6	2.7.2
4213	Oblique-slip fault, right-lateral offset—Identity or existence questionable, location approximate..... A-2-6	2.7.4
4214	Oblique-slip fault, right-lateral offset—Identity or existence questionable, location concealed..... A-2-6	2.7.8
4215	Oblique-slip fault, right-lateral offset—Identity or existence questionable, location inferred A-2-6	2.7.6
4216	Oblique-slip faults..... A-2-6	Sec. 2.7
4217	"Observable" [concepts and definitions] 27	n/a
4218	Observation well for gas-storage field (nonspecific depth)..... A-19-10	19.5.98
4219	Observation well used for domestic-water supply A-26-1	26.1.11
4220	Observation well used for domestic-water supply, equipped with a recorder..... A-26-1	26.1.12
4221	Observation well used for industrial-water supply..... A-26-2	26.1.38
4222	Observation well used for industrial-water supply, equipped with a recorder A-26-2	26.1.39
4223	Observation well used for irrigation-water supply A-26-2	26.1.29
4224	Observation well used for irrigation-water supply, equipped with a recorder..... A-26-2	26.1.30
4225	Observation well used for public-water supply..... A-26-3	26.1.47
4226	Observation well used for public-water supply, equipped with a recorder A-26-3	26.1.48
4227	Observation well used for stock-water supply..... A-26-1	26.1.20
4228	Observation well used for stock-water supply, equipped with a recorder A-26-1	26.1.21
4229	Oceanic rise A-22-2	Sec. 22
4230	Ohio [state location map]..... A-34-2	Sec. 34.1
4231	Oil and gas field—Extent defined..... A-19-6	19.5.5
4232	Oil and gas field—Extent not yet defined..... A-19-6	19.5.6
4233	Oil and gas fields A-19-6	Sec. 19.5
4234	Oil and gas seep..... A-19-9	19.5.61
4235	Oil and gas show..... A-19-9	19.5.62
4236	Oil and gas well (nonspecific depth)..... A-19-9	19.5.63
4237	Oil and gas wells..... A-19-9	Sec. 19.5
4238	Oil field—Extent defined..... A-19-6	19.5.1
4239	Oil field—Extent not yet defined..... A-19-6	19.5.2
4240	Oil fields A-19-6	Sec. 19.5
4241	Oil seep A-19-8	19.5.38
4242	Oil shale..... A-37-1	625
4243	Oil show A-19-8	19.5.39
4244	Oil well, as shown on topographic maps or on general-purpose or smaller scale maps A-30-6	30.3.9
4245	Oil well (nonspecific depth)..... A-19-8	19.5.40
4246	Oil wells A-19-8	Sec. 19.5
4247	Oklahoma [state location map] A-34-2	Sec. 34.1
4248	Older glacial groove—Showing general bearing..... A-13-2	13.31
4249	Older glacial groove—Showing measured bearing..... A-13-2	13.32

		<i>Page</i>	<i>Ref. No.</i>
4250			
4251	Older glacial groove, flow direction unknown—Showing general bearing	A-13-2	13.35
4252	Older glacial groove, flow direction unknown—Showing measured bearing.....	A-13-2	13.36
4253	Older glacial groove (length mapped to scale)	A-13-2	13.39
4254	Older glacial groove (length mapped to scale), flow direction unknown	A-13-2	13.40
4255	Older glacial striation—Showing general bearing	A-13-2	13.31
4256	Older glacial striation—Showing measured bearing.....	A-13-2	13.32
4257	Older glacial striation, flow direction unknown—Showing general bearing.....	A-13-2	13.35
4258	Older glacial striation, flow direction unknown—Showing measured bearing	A-13-2	13.36
4259	Older glacial striation (length mapped to scale).....	A-13-2	13.39
4260	Older glacial striation (length mapped to scale), flow direction unknown.....	A-13-2	13.40
4261	Oolitic dolomite.....	A-37-1	644
4262	Oolitic dolostone.....	A-37-1	644
4263	Oolitic limestone.....	A-37-1	635
4264	Open fracture on landslide	A-17-2	17.34
4265	Open pit.....	A-19-3	19.3.4
4266	Open pit (mapped to scale).....	A-19-3	19.3.6
4267	Open pit mine, as shown on topographic maps or on general-purpose or smaller scale maps.....	A-30-6	30.3.1
4268	Open tension crack on landslide.....	A-17-2	17.34
4269	Open water	A-30-5	30.2.29
4270	Orange [spot color].....	A-v	Table 3
4271	Ordovician [geologic age symbol]	A-32-1	32.17
4272	Ore	A-37-3	733
4273	Ore chute (drawn to scale), as shown on subsurface exploration maps	A-19-5	19.4.13
4274	Oregon [state location map].....	A-34-2	Sec. 34.1
4275	Orientation of contact [concepts and definitions]	13	n/a
4276	Orientation of fault [concepts and definitions]	16	n/a
4277	Orientation of fold [concepts and definitions].....	17	n/a
4278	Ostracodes	A-10-1	10.2.53
4279	Outcrop area of clay bed.....	A-1-4	1.2.44
4280	Outcrop area of coal bed.....	A-1-4	1.2.45
4281	Outcrop area of key bed or bed of economically important commodity (1st option)	A-1-4	1.2.42
4282	Outcrop area of key bed or bed of economically important commodity (2nd option)	A-1-4	1.2.43
4283	Outcrop areas.....	A-31-1	Sec. 31
4284	Outcrop point as structural control point (1st surface)	A-11-1	11.22
4285	Outcrop point as structural control point (2nd surface)	A-11-2	11.32
4286	Outcrop point as structural control point (3rd surface).....	A-11-2	11.42
4287	Outer boundary of central mound of complex terrestrial impact crater	A-24-1	24.18
4288	Outer boundary of floor of terrestrial impact crater.....	A-24-1	24.17
4289	Outer limit of subsidence caused by shock—Identity and existence certain, location accurate	A-21-1	21.16
4290	Outer limit of subsidence caused by shock—Identity and existence certain, location concealed	A-21-1	21.22

	<i>Page</i>	<i>Ref. No.</i>
4291		
4292 Outer limit of subsidence caused by shock—Identity or existence certain, location approximate	A-21-1	21.18
4293 Outer limit of subsidence caused by shock—Identity or existence certain, location inferred.....	A-21-1	21.20
4294 Outer limit of subsidence caused by shock—Identity or existence questionable, location		
4295 accurate	A-21-1	21.17
4296 Outer limit of subsidence caused by shock—Identity or existence questionable, location		
4297 approximate	A-21-1	21.19
4298 Outer limit of subsidence caused by shock—Identity or existence questionable, location		
4299 concealed	A-21-1	21.23
4300 Outer limit of subsidence caused by shock—Identity or existence questionable, location		
4301 inferred.....	A-21-1	21.21
4302 Outline of basalt-filled lava pond.....	A-18-3	18.54
4303 Outline of basin—Accurately located	A-22-2	22.28
4304 Outline of basin—Approximately located	A-22-2	22.29
4305 Outline of glacier	A-30-5	30.2.44
4306 Outline of metamorphic core complex—Identity and existence certain, location accurate	A-23-1	23.1
4307 Outline of metamorphic core complex—Identity and existence certain, location approximate	A-23-1	23.3
4308 Outline of metamorphic core complex—Identity and existence certain, location concealed	A-23-1	23.7
4309 Outline of metamorphic core complex—Identity and existence certain, location inferred.....	A-23-1	23.5
4310 Outline of metamorphic core complex—Identity or existence questionable, location accurate	A-23-1	23.2
4311 Outline of metamorphic core complex—Identity or existence questionable, location		
4312 approximate	A-23-1	23.4
4313 Outline of metamorphic core complex—Identity or existence questionable, location concealed	A-23-1	23.8
4314 Outline of metamorphic core complex—Identity or existence questionable, location inferred.....	A-23-1	23.6
4315 Outline of permanent snowfield	A-30-5	30.2.44
4316 Outline of slip surface of landslide—Identity and existence certain, location accurate.....	A-17-1	17.1
4317 Outline of slip surface of landslide—Identity and existence certain, location approximate.....	A-17-1	17.3
4318 Outline of slip surface of landslide—Identity and existence certain, location concealed.....	A-17-1	17.7
4319 Outline of slip surface of landslide—Identity and existence certain, location inferred	A-17-1	17.5
4320 Outline of slip surface of landslide—Identity or existence questionable, location accurate	A-17-1	17.2
4321 Outline of slip surface of landslide—Identity or existence questionable, location approximate	A-17-1	17.4
4322 Outline of slip surface of landslide—Identity or existence questionable, location concealed	A-17-1	17.8
4323 Outline of slip surface of landslide—Identity or existence questionable, location inferred.....	A-17-1	17.6
4324 Overprint patterns	36	n/a
4325 Overturned anticline (1st option)—Identity and existence certain, location accurate.....	A-5-3	5.3.17
4326 Overturned anticline (1st option)—Identity and existence certain, location approximate.....	A-5-3	5.3.19
4327 Overturned anticline (1st option)—Identity and existence certain, location concealed.....	A-5-3	5.3.23
4328 Overturned anticline (1st option)—Identity and existence certain, location inferred	A-5-3	5.3.21
4329 Overturned anticline (1st option)—Identity or existence questionable, location accurate.....	A-5-3	5.3.18
4330 Overturned anticline (1st option)—Identity or existence questionable, location approximate.....	A-5-3	5.3.20
4331 Overturned anticline (1st option)—Identity or existence questionable, location concealed.....	A-5-3	5.3.24

	<i>Page</i>	<i>Ref. No.</i>
4332		
4333	Overtured anticline (1st option)—Identity or existence questionable, location inferred	A-5-3 5.3.22
4334	Overtured anticline (2nd option)—Identity and existence certain, location accurate.....	A-5-4 5.3.25
4335	Overtured anticline (2nd option)—Identity and existence certain, location approximate.....	A-5-4 5.3.27
4336	Overtured anticline (2nd option)—Identity and existence certain, location concealed.....	A-5-4 5.3.31
4337	Overtured anticline (2nd option)—Identity and existence certain, location inferred	A-5-4 5.3.29
4338	Overtured anticline (2nd option)—Identity or existence questionable, location accurate.....	A-5-4 5.3.26
4339	Overtured anticline (2nd option)—Identity or existence questionable, location approximate.....	A-5-4 5.3.28
4340	Overtured anticline (2nd option)—Identity or existence questionable, location concealed.....	A-5-4 5.3.32
4341	Overtured anticline (2nd option)—Identity or existence questionable, location inferred	A-5-4 5.3.30
4342	Overtured anticlines	A-5-3 Sec. 5.3
4343	Overtured bed of economically important commodity (1st option).....	A-1-6 1.4.5
4344	Overtured bed of economically important commodity (2nd option).....	A-1-6 1.4.6
4345	Overtured bedding	A-6-1 6.4
4346	Overtured bedding in crossbedded rocks	A-6-2 6.32
4347	Overtured bedding, where top direction of beds is known from local features.....	A-6-1 6.15
4348	Overtured clay bed (1st option)	A-1-6 1.4.5
4349	Overtured clay bed (2nd option)	A-1-6 1.4.6
4350	Overtured coal bed (1st option)	A-1-6 1.4.5
4351	Overtured coal bed (2nd option)	A-1-6 1.4.6
4352	Overtured contact (1st option).....	A-1-6 1.4.5
4353	Overtured contact (2nd option).....	A-1-6 1.4.6
4354	Overtured cumulate foliation	A-8-1 8.2.13
4355	Overtured cumulate foliation, where top direction of layers is known from local features.....	A-8-1 8.2.16
4356	Overtured dike (1st option)	A-1-6 1.4.5
4357	Overtured dike (2nd option)	A-1-6 1.4.6
4358	Overtured (dip direction to left) bedding, for multiple observations at one locality	A-6-1 6.10
4359	Overtured (dip direction to left) bedding, where top direction of beds is known from local	
4360	features, for multiple observations at one locality	A-6-1 6.22
4361	Overtured (dip direction to right) bedding, for multiple observations at one locality	A-6-1 6.9
4362	Overtured (dip direction to right) bedding, where top direction of beds is known from local	
4363	features, for multiple observations at one locality	A-6-1 6.21
4364	Overtured graded bedding	A-6-2 6.29
4365	Overtured key bed (1st option).....	A-1-6 1.4.5
4366	Overtured key bed (2nd option).....	A-1-6 1.4.6
4367	Overtured syncline (1st option)—Identity and existence certain, location accurate	A-5-8 5.7.17
4368	Overtured syncline (1st option)—Identity and existence certain, location approximate	A-5-8 5.7.19
4369	Overtured syncline (1st option)—Identity and existence certain, location concealed	A-5-8 5.7.23
4370	Overtured syncline (1st option)—Identity and existence certain, location inferred.....	A-5-8 5.7.21
4371	Overtured syncline (1st option)—Identity or existence questionable, location accurate.....	A-5-8 5.7.18
4372	Overtured syncline (1st option)—Identity or existence questionable, location approximate.....	A-5-8 5.7.20

	<i>Page</i>	<i>Ref. No.</i>
4373		
4374	Overtured syncline (1st option)—Identity or existence questionable, location concealed..... A-5-8	5.7.24
4375	Overtured syncline (1st option)—Identity or existence questionable, location inferred A-5-8	5.7.22
4376	Overtured syncline (2nd option)—Identity and existence certain, location accurate A-5-9	5.7.25
4377	Overtured syncline (2nd option)—Identity and existence certain, location approximate A-5-9	5.7.27
4378	Overtured syncline (2nd option)—Identity and existence certain, location concealed A-5-9	5.7.31
4379	Overtured syncline (2nd option)—Identity and existence certain, location inferred..... A-5-9	5.7.29
4380	Overtured syncline (2nd option)—Identity or existence questionable, location accurate A-5-9	5.7.26
4381	Overtured syncline (2nd option)—Identity or existence questionable, location approximate..... A-5-9	5.7.28
4382	Overtured syncline (2nd option)—Identity or existence questionable, location concealed A-5-9	5.7.32
4383	Overtured syncline (2nd option)—Identity or existence questionable, location inferred A-5-9	5.7.30
4384	Overtured synclines..... A-5-8	Sec. 5.7
4385	Overtured thrust fault (1st option)—Identity and existence certain, location accurate A-2-8	2.9.1
4386	Overtured thrust fault (1st option)—Identity and existence certain, location approximate A-2-8	2.9.3
4387	Overtured thrust fault (1st option)—Identity and existence certain, location concealed A-2-8	2.9.7
4388	Overtured thrust fault (1st option)—Identity and existence certain, location inferred..... A-2-8	2.9.5
4389	Overtured thrust fault (1st option)—Identity or existence questionable, location accurate..... A-2-8	2.9.2
4390	Overtured thrust fault (1st option)—Identity or existence questionable, location approximate..... A-2-8	2.9.4
4391	Overtured thrust fault (1st option)—Identity or existence questionable, location concealed A-2-8	2.9.8
4392	Overtured thrust fault (1st option)—Identity or existence questionable, location inferred A-2-8	2.9.6
4393	Overtured thrust fault (2nd option)—Identity and existence certain, location accurate A-2-8	2.9.9
4394	Overtured thrust fault (2nd option)—Identity and existence certain, location approximate A-2-8	2.9.11
4395	Overtured thrust fault (2nd option)—Identity and existence certain, location concealed A-2-8	2.9.15
4396	Overtured thrust fault (2nd option)—Identity and existence certain, location inferred..... A-2-8	2.9.13
4397	Overtured thrust fault (2nd option)—Identity or existence questionable, location accurate..... A-2-8	2.9.10
4398	Overtured thrust fault (2nd option)—Identity or existence questionable, location approximate..... A-2-8	2.9.12
4399	Overtured thrust fault (2nd option)—Identity or existence questionable, location concealed..... A-2-8	2.9.16
4400	Overtured thrust fault (2nd option)—Identity or existence questionable, location inferred A-2-8	2.9.14
4401	Overtured thrust fault (3rd option)—Identity and existence certain, location accurate..... A-2-8	2.9.17
4402	Overtured thrust fault (3rd option)—Identity and existence certain, location approximate..... A-2-8	2.9.19
4403	Overtured thrust fault (3rd option)—Identity and existence certain, location concealed..... A-2-8	2.9.23
4404	Overtured thrust fault (3rd option)—Identity and existence certain, location inferred A-2-8	2.9.21
4405	Overtured thrust fault (3rd option)—Identity or existence questionable, location accurate A-2-8	2.9.18
4406	Overtured thrust fault (3rd option)—Identity or existence questionable, location approximate A-2-8	2.9.20
4407	Overtured thrust fault (3rd option)—Identity or existence questionable, location concealed A-2-8	2.9.24
4408	Overtured thrust fault (3rd option)—Identity or existence questionable, location inferred..... A-2-8	2.9.22
4409	Overtured thrust faults..... A-2-8	Sec. 2.9
4410		
4411	Paleogene [geologic age symbol] A-32-1	32.5
4412	Paleontological features A-10-1	Sec. 10
4413	Paleozoic [geologic age symbol] A-32-1	32.10

	<i>Page</i>	<i>Ref. No.</i>
4414		
4415	Palimpsest area around complex terrestrial impact crater..... A-24-1	24.20
4416	Palimpsest ring, planetary A-25-4	25.93
4417	Palynomorphs A-10-1	10.2.54
4418	Pantone color [equivalents of spot colors] A-v	Table 3
4419	Parish boundary A-29-1	29.3
4420	Park (small) boundary..... A-29-1	29.7
4421	Partial-record low-flow measurement water gaging station (floods)..... A-26-5	26.3.11
4422	Partial-record peak-flow measurement water gaging station (floods)..... A-26-5	26.3.10
4423	Partial-record stage-measurement water gaging station (floods)..... A-26-5	26.3.12
4424	Partial-record water gaging station (floods)..... A-26-5	26.3.8
4425	Partial-record water gaging station (floods), equipped with a telephone or radio A-26-5	26.3.9
4426	Parting lineation A-9-1	Sec. 9
4427	Partly buried arcuate fracture, planetary..... A-25-2	25.32
4428	Partly buried regional fracture, planetary A-25-2	25.30
4429	Path of gully on landslide..... A-17-3	17.46
4430	Pattern Chart In pocket	n/a
4431	Pattern Chart explanation..... A-38-1	Sec. 38
4432	Pattern selection guidelines 33	n/a
4433	Pattern specifications [in this standard]..... 42	n/a
4434	Peak-flow measurement site without a gage..... A-26-5	26.3.15
4435	Peat A-37-2	657
4436	Pelecypods..... A-10-1	10.2.24
4437	Pencil structure..... A-9-4	Sec. 9
4438	Penetrative foliation..... A-8-3	Sec. 8.3
4439	Penetrative lineations, within tessera terrain, planetary A-25-3	25.66
4440	Pennsylvania [state location map]..... A-34-2	Sec. 34.1
4441	Pennsylvanian [geologic age symbol] A-32-1	32.13
4442	Penstock..... A-30-4	30.2.24
4443	Perennial creek (double-line drainage) A-30-4	30.2.3
4444	Perennial creek (single-line drainage) A-30-4	30.2.1
4445	Perennial lake A-30-5	30.2.32
4446	Perennial pond A-30-5	30.2.32
4447	Perennial river (double-line drainage) A-30-4	30.2.3
4448	Perennial river (single-line drainage) A-30-4	30.2.1
4449	Perennial stream (double-line drainage)..... A-30-4	30.2.3
4450	Perennial stream (single-line drainage)..... A-30-4	30.2.1
4451	Periglacial features A-14-1	Sec. 14
4452	Periglacial patterned ground A-14-1	14.2
4453	Periglacial patterns (Series 500)..... Pattern Chart	n/a
4454	Permanent snowfield A-30-5	30.2.44

	<i>Page</i>	<i>Ref. No.</i>
4455		
4456	Permian [geologic age symbol]..... A-32-1	32.11
4457	Phosphatic-nodular rock..... A-37-2	666
4458	Pingo..... A-14-1	14.1
4459	Pipelines (oil and gas)..... A-30-6	Sec. 30.3
4460	Pipelines (water)..... A-30-4	Sec. 30.2
4461	Pit-crater chain (mapped to scale), planetary..... A-25-5	25.105
4462	Pit of impact crater floor, planetary (1st option)..... A-25-5	25.103
4463	Pit of impact crater floor, planetary (2nd option)..... A-25-5	25.104
4464	Pits..... A-19-3	Sec. 19.3
4465	Placement of point symbols for linear features relative to point of observation [concepts and	
4466	definitions]..... 20	n/a
4467	Placement of point symbols for planar features relative to point of observation [concepts and	
4468	definitions]..... 19	n/a
4469	Placer pit..... A-19-3	19.3.2
4470	Planar-feature geologic point data [concepts and definitions]..... 18	n/a
4471	Planar geologic features [concepts and definitions]..... 12	n/a
4472	Planetary geology features..... A-25-1	Sec. 25
4473	Planktonic foraminifera..... A-10-1	10.2.51
4474	Plants..... A-10-1	10.2.31
4475	Plate-tectonic features..... A-22-1	Sec. 22
4476	Plugged and abandoned condensate well (nonspecific depth)..... A-19-9	19.5.75
4477	Plugged and abandoned deep condensate well..... A-19-9	19.5.81
4478	Plugged and abandoned deep disposal well..... A-19-7	19.5.31
4479	Plugged and abandoned deep gas and condensate well..... A-19-10	19.5.91
4480	Plugged and abandoned deep gas storage well..... A-19-10	19.5.97
4481	Plugged and abandoned deep gas well..... A-19-8	19.5.59
4482	Plugged and abandoned deep observation well for gas-storage field..... A-19-10	19.5.103
4483	Plugged and abandoned deep oil and gas well..... A-19-9	19.5.71
4484	Plugged and abandoned deep oil well..... A-19-8	19.5.48
4485	Plugged and abandoned deep salt-water disposal well..... A-19-7	19.5.37
4486	Plugged and abandoned disposal well (nonspecific depth)..... A-19-7	19.5.27
4487	Plugged and abandoned gas and condensate well (nonspecific depth)..... A-19-10	19.5.85
4488	Plugged and abandoned gas storage well (nonspecific depth)..... A-19-10	19.5.93
4489	Plugged and abandoned gas well (nonspecific depth)..... A-19-8	19.5.53
4490	Plugged and abandoned observation well for gas-storage field (nonspecific depth)..... A-19-10	19.5.99
4491	Plugged and abandoned oil and gas well (nonspecific depth)..... A-19-9	19.5.65
4492	Plugged and abandoned oil well (nonspecific depth)..... A-19-8	19.5.42
4493	Plugged and abandoned salt-water disposal well (nonspecific depth)..... A-19-7	19.5.33
4494	Plugged and abandoned shallow condensate well..... A-19-9	19.5.78
4495	Plugged and abandoned shallow disposal well..... A-19-7	19.5.29

	<i>Page</i>	<i>Ref. No.</i>
4496		
4497	Plugged and abandoned shallow gas and condensate well..... A-19-10	19.5.88
4498	Plugged and abandoned shallow gas storage well..... A-19-10	19.5.95
4499	Plugged and abandoned shallow gas well..... A-19-8	19.5.56
4500	Plugged and abandoned shallow observation well for gas-storage field..... A-19-10	19.5.101
4501	Plugged and abandoned shallow oil and gas well..... A-19-9	19.5.68
4502	Plugged and abandoned shallow oil well..... A-19-8	19.5.45
4503	Plugged and abandoned shallow salt-water disposal well..... A-19-7	19.5.35
4504	Plunge [concepts and definitions]..... 19	n/a
4505	Plunging anticline..... A-5-13	5.10.5
4506	Plunging syncline..... A-5-13	5.10.7
4507	Point features [concepts and definitions]..... 18	n/a
4508	Point of observation [illustrated]..... A-ii	n/a
4509	Point of observation of point symbols for linear features [concepts and definitions]..... 20	n/a
4510	Point of observation of point symbols for planar features [concepts and definitions]..... 19	n/a
4511	Point symbols for linear features -- placement relative to point of observation [concepts and	
4512	definitions]..... 20	n/a
4513	Point symbols for planar features -- placement relative to point of observation [concepts and	
4514	definitions]..... 19	n/a
4515	Points in geologic map databases [concepts and definitions]..... 11	n/a
4516	Points on geologic maps [concepts and definitions]..... 10	n/a
4517	Points (pts) to millimeters (mm) or inches (in)..... A-iv	Table 1
4518	Pollen and (or) spores..... A-10-1	10.2.58
4519	Polygon, ice-wedge..... A-14-1	14.8
4520	Polygonal patterned ground..... A-14-1	14.3
4521	Polygons, ice-wedge..... A-14-1	14.9
4522	Polygons in geologic map databases [concepts and definitions]..... 11	n/a
4523	Ponds..... A-30-5	Sec. 30.2
4524	Porphyritic rock (1st option)..... A-37-3	729
4525	Porphyritic rock (2nd option)..... A-37-3	730
4526	Portal..... A-19-3	19.3.19
4527	Portal and open cut..... A-19-3	19.3.23
4528	Portal showing angle of inclination..... A-19-3	19.3.24
4529	Positional accuracy [concepts and definitions]..... 28	n/a
4530	Positioning [concepts and definitions]..... 27	n/a
4531	Possible salt dome..... A-23-1	23.14
4532	PostScript implementation [of this standard]..... 4	n/a
4533	Potentiometric contour (index), showing altitude at which water level would have stood in tightly	
4534	cased wells [date]—Accurately located..... A-26-7	26.5.13
4535	Potentiometric contour (index), showing altitude at which water level would have stood in tightly	
4536	cased wells [date]—Approximately located..... A-26-7	26.5.14

	<i>Page</i>	<i>Ref. No.</i>
4537		
4538	Potentiometric contour (intermediate), showing altitude at which water level would have stood in	
4539	tightly cased wells [date]—Accurately located..... A-26-7	26.5.15
4540	Potentiometric contour (intermediate), showing altitude at which water level would have stood in	
4541	tightly cased wells [date]—Approximately located..... A-26-7	26.5.16
4542	Power transmission line..... A-30-6	30.3.21
4543	Pre-Archean [geologic age symbol]..... A-32-2	32.34
4544	Precambrian [geologic age symbol]..... A-32-1	32.19
4545	Precinct boundary A-29-1	29.4
4546	Preparers of this standard..... 9	n/a
4547	Pressure ridge in landslide—Active, sharp, distinct, and accurately located..... A-17-2	17.22
4548	Pressure ridge in landslide—Inactive, subdued, indistinct, and (or) approximately located A-17-2	17.23
4549	Pressure ridge in landslide, showing transport reversal—Active, sharp, distinct, and accurately	
4550	located..... A-17-2	17.24
4551	Pressure ridge in landslide, showing transport reversal—Inactive, subdued, indistinct, and (or)	
4552	approximately located..... A-17-2	17.25
4553	Pressure ridge on lava flow..... A-18-2	18.47
4554	Previous U.S. Geological Survey standards..... 5	n/a
4555	Primary bathymetric contour..... A-30-2	30.1.23
4556	Primary bathymetric contour—Approximate..... A-30-2	30.1.24
4557	Primary bathymetric depression contour A-30-2	30.1.33
4558	Primary bathymetric rise contour (inside depression) A-30-2	30.1.34
4559	Primary foliation (in igneous rocks) A-8-1	Sec. 8.2
4560	Primary highway, divided by centerline (Class 1) A-28-1	28.4
4561	Primary highway, divided by median strip (Class 1) A-28-1	28.5
4562	Primary highway, undivided (Class 1)..... A-28-1	28.3
4563	Primary layering (in igneous rocks)..... A-8-1	Sec. 8.2
4564	Primary terrestrial impact crater (too small to draw to scale) (1st option)..... A-24-1	24.1
4565	Primary terrestrial impact crater (too small to draw to scale) (2nd option)..... A-24-1	24.3
4566	Process-color ink 35	n/a
4567	Prospect, as shown on topographic maps or on general-purpose or smaller scale maps..... A-30-6	30.3.5
4568	Prospect (pit or small open cut)..... A-19-3	19.3.1
4569	Proterozoic [geologic age symbol] A-32-1	32.20
4570	Public Review Draft [of this standard] 4	n/a
4571	Puerto Rico [location map]..... A-34-2	Sec. 34.1
4572	Pumping station, as shown on topographic maps or on general-purpose or smaller scale maps..... A-30-6	30.3.15
4573	Purple [spot color]..... A-v	Table 3
4574	Purpose of map [influencing color and pattern selection]..... 33	n/a
4575		
4576	Quality-of-water site, type of measurement unspecified..... A-26-6	26.4.1
4577	Quality-of-water sites A-26-6	Sec. 26.4

	<i>Page</i>	<i>Ref. No.</i>
4578		
4579	Quarry..... A-19-3	19.3.4
4580	Quarry, as shown on topographic maps or on general-purpose or smaller scale maps..... A-30-6	30.3.1
4581	Quarry (mapped to scale)..... A-19-3	19.3.6
4582	Quartz..... A-37-3	732
4583	Quartzite..... A-37-3	702
4584	Quaternary displacement (undifferentiated)..... A-2-16	2.13.4
4585	Quaternary faulting..... A-2-16	Sec. 2.13
4586	Quaternary [geologic age symbol]..... A-32-1	32.2
4587	Queried dip value [concepts and definitions]..... 26	n/a
4588	Queried line symbol [concepts and definitions]..... 26	n/a
4589	Queried map-unit label [concepts and definitions]..... 26	n/a
4590	Queried plunge value [concepts and definitions]..... 26	n/a
4591	"Questionable" [concepts and definitions]..... 22	n/a
4592		
4593	R [abbreviation]..... A-v	Table 2
4594	Radial fracture, planetary (associated with coronae)..... A-25-2	25.33
4595	Radially grooved ejecta (schematic), planetary..... A-25-3	25.50
4596	Radiolarians..... A-10-1	10.2.59
4597	Radiometric survey..... A-3-1	Sec. 3
4598	Railroad (more than one track)..... A-28-1	28.20
4599	Railroad (single track)..... A-28-1	28.19
4600	Raise (drawn to scale), as shown on subsurface exploration maps..... A-19-5	19.4.8
4601	Raise extending through level (drawn to scale), as shown on subsurface exploration maps..... A-19-5	19.4.7
4602	Raised rim of impact crater, planetary, showing visible ejecta blanket..... A-25-5	25.96
4603	Raised rim of larger impact crater, planetary..... A-25-5	25.94
4604	Raised rim of smaller impact crater, planetary..... A-25-5	25.95
4605	Range label..... A-31-1	31.4
4606	Rapids (double-line drainage)..... A-30-5	30.2.28
4607	Rapids (single-line drainage)..... A-30-5	30.2.27
4608	Raster-image processing [concepts and definitions]..... 41	n/a
4609	Reactivated debris flow, showing a sharply defined morphology..... A-17-3	17.56
4610	Reactivated landslide (mapped to scale), showing a sharply defined morphology..... A-17-3	17.58
4611	Recent volcano on small-scale maps..... A-18-3	18.65
4612	Recharge or waste-injection well, once used for domestic-water supply..... A-26-1	26.1.10
4613	Recharge or waste-injection well, once used for industrial-water supply..... A-26-2	26.1.37
4614	Recharge or waste-injection well, once used for irrigation-water supply..... A-26-2	26.1.28
4615	Recharge or waste-injection well, once used for public-water supply..... A-26-3	26.1.46
4616	Recharge or waste-injection well, once used for stock-water supply..... A-26-1	26.1.19
4617	Red [spot color]..... A-v	Table 3
4618	References..... 44	n/a

	<i>Page</i>	<i>Ref. No.</i>
4619		
4620	Regional fracture, planetary..... A-25-2	25.29
4621	Related standards [to this standard]..... 2	n/a
4622	Relation of new FGDC standard terminology to historically used terminology and to traditional	
4623	line symbol styles..... 24	Fig. 1
4624	Relation [of this standard] to previous U.S. Geological Survey standards 5	n/a
4625	Relative age of intrusive or extrusive units where known (Y, younger; O, older)..... A-1-6	1.4.9
4626	Relict landslide (mapped to scale), showing a weak morphology A-17-3	17.61
4627	Reptiles..... A-10-1	10.2.30
4628	Reservoir (uncovered) with man-made shoreline A-30-5	30.2.39
4629	Reservoir with natural shoreline..... A-30-5	30.2.36
4630	Resistivity survey..... A-3-1	Sec. 3
4631	Reticulate pattern on plains, planetary..... A-25-6	25.131
4632	Retreatal position of stagnant ice margin—Identity and existence certain, location accurate A-13-3	13.64
4633	Retreatal position of stagnant ice margin—Identity and existence certain, location approximate A-13-3	13.66
4634	Retreatal position of stagnant ice margin—Identity and existence certain, location concealed A-13-3	13.70
4635	Retreatal position of stagnant ice margin—Identity and existence certain, location inferred..... A-13-3	13.68
4636	Retreatal position of stagnant ice margin—Identity or existence questionable, location accurate A-13-3	13.65
4637	Retreatal position of stagnant ice margin—Identity or existence questionable, location	
4638	approximate A-13-3	13.67
4639	Retreatal position of stagnant ice margin—Identity or existence questionable, location	
4640	concealed A-13-3	13.71
4641	Retreatal position of stagnant ice margin—Identity or existence questionable, location inferred..... A-13-3	13.69
4642	Retreatal position of stagnant ice margin, showing name of depositional unit..... A-13-3	13.72
4643	Reverse fault—Identity and existence certain, location accurate A-2-3	2.4.1
4644	Reverse fault—Identity and existence certain, location approximate A-2-3	2.4.3
4645	Reverse fault—Identity and existence certain, location concealed A-2-3	2.4.7
4646	Reverse fault—Identity and existence certain, location inferred..... A-2-3	2.4.5
4647	Reverse fault—Identity or existence questionable, location accurate A-2-3	2.4.2
4648	Reverse fault—Identity or existence questionable, location approximate A-2-3	2.4.4
4649	Reverse fault—Identity or existence questionable, location concealed A-2-3	2.4.8
4650	Reverse fault—Identity or existence questionable, location inferred..... A-2-3	2.4.6
4651	Reverse fault (on small-scale maps or figures)..... A-2-11	2.11.23
4652	Reverse faults A-2-3	Sec. 2.4
4653	Reverse-slip rotational faults..... A-2-4	Sec. 2.5
4654	Reverse-slip scissor faults A-2-4	Sec. 2.5
4655	Revised FGDC standard terminology..... 24	Fig. 1
4656	RGB [abbreviation] A-v	Table 2
4657	RGB color [equivalents of spot colors]..... A-v	Table 3
4658	RGB color model 35	n/a
4659	Rhode Island [state location map]..... A-34-2	Sec. 34.1

	<i>Page</i>	<i>Ref. No.</i>
4660		
4661 Ribbon trends, planetary	A-25-2	25.38
4662 Rice field.....	A-30-5	30.2.48
4663 Ridge belt, planetary	A-25-2	25.39
4664 Ridge crest, planetary (1st option)	A-25-2	25.41
4665 Ridge crest, planetary (1st option), showing abrupt termination of ridge.....	A-25-2	25.43
4666 Ridge crest, planetary (2nd option)	A-25-2	25.42
4667 Ridge crest, planetary (2nd option), showing abrupt termination of ridge.....	A-25-2	25.44
4668 Ridge crest (possible dike), planetary.....	A-25-2	25.45
4669 Ridges in landslides	A-17-2	Sec. 17
4670 Ridges on beach.....	A-15-1	15.2
4671 Ridges on moraine.....	A-13-1	13.14
4672 Right flank of landslide—Active, sharp, distinct, and accurately located	A-17-2	17.26
4673 Right flank of landslide—Concealed by landslide deposits or debris materials	A-17-2	17.28
4674 Right flank of landslide—Inactive, subdued, indistinct, and (or) approximately located.....	A-17-2	17.27
4675 Right flank of landslide, showing amount of offset.....	A-17-2	17.29
4676 Right-hand rule [concepts and definitions].....	18	n/a
4677 Right-hand rule [illustrated].....	A-ii	n/a
4678 Right-lateral oblique-slip faults.....	A-2-6	Sec. 2.7
4679 Right-lateral shear feature in landslide—Active, sharp, distinct, and accurately located.....	A-17-2	17.26
4680 Right-lateral shear feature in landslide—Concealed by landslide deposits or debris materials.....	A-17-2	17.28
4681 Right-lateral shear feature in landslide—Inactive, subdued, indistinct, and (or) approximately		
4682 located.....	A-17-2	17.27
4683 Right-lateral shear feature in landslide, showing amount of offset	A-17-2	17.29
4684 Right-lateral strike-slip faults	A-2-5	Sec. 2.6
4685 Rim around closed depression of eolian origin in bedrock—Accurately located.....	A-16-1	16.4
4686 Rim around closed depression of eolian origin in bedrock—Approximately located.....	A-16-1	16.5
4687 Rim around closed depression of eolian origin in dune field	A-16-1	16.3
4688 Rim crest, formed by shock or sand blowouts—Identity and existence certain, location		
4689 accurate	A-21-2	21.24
4690 Rim crest, formed by shock or sand blowouts—Identity and existence certain, location		
4691 concealed	A-21-2	21.28
4692 Rim crest, formed by shock or sand blowouts—Identity or existence certain, location		
4693 approximate	A-21-2	21.26
4694 Rim crest, formed by shock or sand blowouts—Identity or existence questionable, location		
4695 accurate	A-21-2	21.25
4696 Rim crest, formed by shock or sand blowouts—Identity or existence questionable, location		
4697 approximate	A-21-2	21.27
4698 Rim crest, formed by shock or sand blowouts—Identity or existence questionable, location		
4699 concealed	A-21-2	21.29
4700 Rim of volcanic crater—Identity and existence certain, location accurate	A-18-1	18.1

	<i>Page</i>	<i>Ref. No.</i>
4701		
4702 Rim of volcanic crater—Identity and existence certain, location concealed	A-18-1	18.5
4703 Rim of volcanic crater—Identity or existence certain, location approximate	A-18-1	18.3
4704 Rim of volcanic crater—Identity or existence questionable, location accurate	A-18-1	18.2
4705 Rim of volcanic crater—Identity or existence questionable, location approximate	A-18-1	18.4
4706 Rim of volcanic crater—Identity or existence questionable, location concealed	A-18-1	18.6
4707 Rim of volcanic crater, showing low point of crater	A-18-1	18.7
4708 Rimless impact crater, planetary	A-25-5	25.98
4709 "RIP" [concepts and definitions]	41	n/a
4710 Ripple-bedded sand	A-37-1	611
4711 Ripple-bedded sandstone	A-37-1	611
4712 Ripple-bedded subgraywacke	A-37-2	656
4713 River mileage marker	A-30-4	30.2.4
4714 Rivers	A-30-4	Sec. 30.2
4715 Road (generic)	A-28-1	28.2
4716 Roads	A-28-1	Sec. 28
4717 Rock	A-30-6	30.3.16
4718 Rock slide, consisting of a relatively intact mass of displaced materials	A-17-3	17.62
4719 Rodding	A-9-3	Sec. 9
4720 Rootless vent area on lava flow	A-18-3	18.60
4721 Roots	A-10-1	10.2.33
4722 Rotational fault, normal-slip offset—Identity and existence certain, location accurate	A-2-4	2.5.9
4723 Rotational fault, normal-slip offset—Identity and existence certain, location approximate	A-2-4	2.5.11
4724 Rotational fault, normal-slip offset—Identity and existence certain, location concealed	A-2-4	2.5.15
4725 Rotational fault, normal-slip offset—Identity and existence certain, location inferred	A-2-4	2.5.13
4726 Rotational fault, normal-slip offset—Identity or existence questionable, location accurate	A-2-4	2.5.10
4727 Rotational fault, normal-slip offset—Identity or existence questionable, location approximate	A-2-4	2.5.12
4728 Rotational fault, normal-slip offset—Identity or existence questionable, location concealed	A-2-4	2.5.16
4729 Rotational fault, normal-slip offset—Identity or existence questionable, location inferred	A-2-4	2.5.14
4730 Rotational fault, reverse-slip offset—Identity and existence certain, location accurate	A-2-4	2.5.1
4731 Rotational fault, reverse-slip offset—Identity and existence certain, location approximate	A-2-4	2.5.3
4732 Rotational fault, reverse-slip offset—Identity and existence certain, location concealed	A-2-4	2.5.7
4733 Rotational fault, reverse-slip offset—Identity and existence certain, location inferred	A-2-4	2.5.5
4734 Rotational fault, reverse-slip offset—Identity or existence questionable, location accurate	A-2-4	2.5.2
4735 Rotational fault, reverse-slip offset—Identity or existence questionable, location approximate	A-2-4	2.5.4
4736 Rotational fault, reverse-slip offset—Identity or existence questionable, location concealed	A-2-4	2.5.8
4737 Rotational fault, reverse-slip offset—Identity or existence questionable, location inferred	A-2-4	2.5.6
4738 Rotational faults	A-2-4	Sec. 2.5
4739 Rotational landslide, consisting of a relatively intact mass of displaced materials	A-17-3	17.62
4740 Ruins	A-30-6	30.3.20
4741		

	<i>Page</i>	<i>Ref. No.</i>
4742		
4743	Sag pond on landslide (mapped to scale)..... A-17-3	17.49
4744	Salt A-37-2	668
4745	Salt and (or) shale diapirs..... A-23-1	23.15
4746	Salt dome A-23-1	23.13
4747	Salt flat A-30-5	30.2.41
4748	Salt-water disposal well (nonspecific depth)..... A-19-7	19.5.32
4749	Sample locality, showing sample number..... A-31-1	31.21
4750	Sand pit A-19-3	19.3.2
4751	Sand pit, as shown on topographic maps or on general-purpose or smaller scale maps A-30-6	30.3.2
4752	Sandy dolomite A-37-2	645
4753	Sandy dolostone A-37-2	645
4754	Sandy limestone A-37-1	636
4755	Sandy shale..... A-37-1	619
4756	Sans-serif font [illustrated] A-ii	n/a
4757	Scale calculations..... A-35-6	Sec. 35
4758	Scales..... A-35-1	Sec. 35
4759	Scarp at top of ice-contact slope..... A-13-1	13.15
4760	Scarp on detachment fault (sense of slip unspecified) (1st option)—Identity and existence	
4761	certain, location accurate A-2-15	2.12.69
4762	Scarp on detachment fault (sense of slip unspecified) (1st option)—Identity and existence	
4763	certain, location approximate A-2-15	2.12.71
4764	Scarp on detachment fault (sense of slip unspecified) (1st option)—Identity or existence	
4765	questionable, location accurate A-2-15	2.12.70
4766	Scarp on detachment fault (sense of slip unspecified) (1st option)—Identity or existence	
4767	questionable, location approximate A-2-15	2.12.72
4768	Scarp on detachment fault (sense of slip unspecified) (2nd option)—Identity and existence	
4769	certain, location accurate A-2-15	2.12.73
4770	Scarp on detachment fault (sense of slip unspecified) (2nd option)—Identity and existence	
4771	certain, location approximate A-2-15	2.12.75
4772	Scarp on detachment fault (sense of slip unspecified) (2nd option)—Identity or existence	
4773	questionable, location accurate A-2-15	2.12.74
4774	Scarp on detachment fault (sense of slip unspecified) (2nd option)—Identity or existence	
4775	questionable, location approximate A-2-15	2.12.76
4776	Scarp on detachment fault (sense of slip unspecified) (3rd option)—Identity and existence	
4777	certain, location accurate A-2-15	2.12.77
4778	Scarp on detachment fault (sense of slip unspecified) (3rd option)—Identity and existence	
4779	certain, location approximate A-2-15	2.12.79
4780	Scarp on detachment fault (sense of slip unspecified) (3rd option)—Identity or existence	
4781	questionable, location accurate A-2-15	2.12.78
4782	Scarp on detachment fault (sense of slip unspecified) (3rd option)—Identity or existence	
4783	questionable, location approximate A-2-15	2.12.80

	<i>Page</i>	<i>Ref. No.</i>
4784		
4785	Scarp on dune crest, caused by slip A-16-1	16.2
4786	Scarp on fault—Identity and existence certain, location accurate A-2-12	2.12.1
4787	Scarp on fault—Identity and existence certain, location approximate A-2-12	2.12.3
4788	Scarp on fault—Identity or existence questionable, location accurate A-2-12	2.12.2
4789	Scarp on fault—Identity or existence questionable, location approximate A-2-12	2.12.4
4790	Scarp on listric fault at head of detachment fault (sense of slip unspecified)—Identity and	
4791	existence certain, location accurate A-2-15	2.12.85
4792	Scarp on listric fault at head of detachment fault (sense of slip unspecified)—Identity and	
4793	existence certain, location approximate A-2-15	2.12.87
4794	Scarp on listric fault at head of detachment fault (sense of slip unspecified)—Identity or	
4795	existence questionable, location accurate A-2-15	2.12.86
4796	Scarp on listric fault at head of detachment fault (sense of slip unspecified)—Identity or	
4797	existence questionable, location approximate A-2-15	2.12.88
4798	Scarp on low-angle fault (unknown or unspecified sense of slip)—Identity and existence	
4799	certain, location accurate A-2-12	2.12.13
4800	Scarp on low-angle fault (unknown or unspecified sense of slip)—Identity and existence	
4801	certain, location approximate A-2-12	2.12.15
4802	Scarp on low-angle fault (unknown or unspecified sense of slip)—Identity or existence	
4803	questionable, location accurate A-2-12	2.12.14
4804	Scarp on low-angle fault (unknown or unspecified sense of slip)—Identity or existence	
4805	questionable, location approximate A-2-12	2.12.16
4806	Scarp on low-angle normal fault—Identity and existence certain, location accurate A-2-12	2.12.9
4807	Scarp on low-angle normal fault—Identity and existence certain, location approximate A-2-12	2.12.11
4808	Scarp on low-angle normal fault—Identity or existence questionable, location accurate A-2-12	2.12.10
4809	Scarp on low-angle normal fault—Identity or existence questionable, location approximate A-2-12	2.12.12
4810	Scarp on master detachment fault (sense of slip unspecified)—Identity and existence certain,	
4811	location accurate A-2-15	2.12.81
4812	Scarp on master detachment fault (sense of slip unspecified)—Identity and existence certain,	
4813	location approximate A-2-15	2.12.83
4814	Scarp on master detachment fault (sense of slip unspecified)—Identity or existence questionable,	
4815	location accurate A-2-15	2.12.82
4816	Scarp on master detachment fault (sense of slip unspecified)—Identity or existence questionable,	
4817	location approximate A-2-15	2.12.84
4818	Scarp on normal fault—Identity and existence certain, location accurate A-2-12	2.12.5
4819	Scarp on normal fault—Identity and existence certain, location approximate A-2-12	2.12.7
4820	Scarp on normal fault—Identity or existence questionable, location accurate A-2-12	2.12.6
4821	Scarp on normal fault—Identity or existence questionable, location approximate A-2-12	2.12.8
4822	Scarp on oblique-slip fault, left-lateral offset—Identity and existence certain, location accurate A-2-13	2.12.41
4823	Scarp on oblique-slip fault, left-lateral offset—Identity and existence certain, location	
4824	approximate A-2-13	2.12.43
4825		

	<i>Page</i>	<i>Ref. No.</i>
4826		
4827	Scarp on oblique-slip fault, left-lateral offset—Identity or existence questionable, location	
4828	accurate	A-2-13 2.12.42
4829	Scarp on oblique-slip fault, left-lateral offset—Identity or existence questionable, location	
4830	approximate	A-2-13 2.12.44
4831	Scarp on oblique-slip fault, right-lateral offset—Identity and existence certain, location	
4832	accurate	A-2-13 2.12.37
4833	Scarp on oblique-slip fault, right-lateral offset—Identity and existence certain, location	
4834	approximate	A-2-13 2.12.39
4835	Scarp on oblique-slip fault, right-lateral offset—Identity or existence questionable, location	
4836	accurate	A-2-13 2.12.38
4837	Scarp on oblique-slip fault, right-lateral offset—Identity or existence questionable, location	
4838	approximate	A-2-13 2.12.40
4839	Scarp on overturned thrust fault (1st option)—Identity and existence certain, location accurate	A-2-14 2.12.57
4840	Scarp on overturned thrust fault (1st option)—Identity and existence certain, location	
4841	approximate	A-2-14 2.12.59
4842	Scarp on overturned thrust fault (1st option)—Identity or existence questionable, location	
4843	accurate	A-2-14 2.12.58
4844	Scarp on overturned thrust fault (1st option)—Identity or existence questionable, location	
4845	approximate	A-2-14 2.12.60
4846	Scarp on overturned thrust fault (2nd option)—Identity and existence certain, location accurate	A-2-14 2.12.61
4847	Scarp on overturned thrust fault (2nd option)—Identity and existence certain, location	
4848	approximate	A-2-14 2.12.63
4849	Scarp on overturned thrust fault (2nd option)—Identity or existence questionable, location	
4850	accurate	A-2-14 2.12.62
4851	Scarp on overturned thrust fault (2nd option)—Identity or existence questionable, location	
4852	approximate	A-2-14 2.12.64
4853	Scarp on overturned thrust fault (3rd option)—Identity and existence certain, location accurate	A-2-14 2.12.65
4854	Scarp on overturned thrust fault (3rd option)—Identity and existence certain, location	
4855	approximate	A-2-14 2.12.67
4856	Scarp on overturned thrust fault (3rd option)—Identity or existence questionable, location	
4857	accurate	A-2-14 2.12.66
4858	Scarp on overturned thrust fault (3rd option)—Identity or existence questionable, location	
4859	approximate	A-2-14 2.12.68
4860	Scarp on reverse fault—Identity and existence certain, location accurate	A-2-12 2.12.17
4861	Scarp on reverse fault—Identity and existence certain, location approximate	A-2-12 2.12.19
4862	Scarp on reverse fault—Identity or existence questionable, location accurate	A-2-12 2.12.18
4863	Scarp on reverse fault—Identity or existence questionable, location approximate	A-2-12 2.12.20
4864	Scarp on rotational fault, normal-slip offset—Identity and existence certain, location accurate	A-2-13 2.12.25
4865	Scarp on rotational fault, normal-slip offset—Identity and existence certain, location	
4866	approximate	A-2-13 2.12.27
4867		

	<i>Page</i>	<i>Ref. No.</i>
4868		
4869	Scarp on rotational fault, normal-slip offset—Identity or existence questionable, location	
4870	accurate	A-2-13 2.12.26
4871	Scarp on rotational fault, normal-slip offset—Identity or existence questionable, location	
4872	approximate	A-2-13 2.12.28
4873	Scarp on rotational fault, reverse-slip offset—Identity and existence certain, location accurate	A-2-13 2.12.21
4874	Scarp on rotational fault, reverse-slip offset—Identity and existence certain, location	
4875	approximate	A-2-13 2.12.23
4876	Scarp on rotational fault, reverse-slip offset—Identity or existence questionable, location	
4877	accurate	A-2-13 2.12.22
4878	Scarp on rotational fault, reverse-slip offset—Identity or existence questionable, location	
4879	approximate	A-2-13 2.12.24
4880	Scarp on scissor fault, normal-slip offset—Identity and existence certain, location accurate	A-2-13 2.12.25
4881	Scarp on scissor fault, normal-slip offset—Identity and existence certain, location approximate	A-2-13 2.12.27
4882	Scarp on scissor fault, normal-slip offset—Identity or existence questionable, location accurate	A-2-13 2.12.26
4883	Scarp on scissor fault, normal-slip offset—Identity or existence questionable, location	
4884	approximate	A-2-13 2.12.28
4885	Scarp on scissor fault, reverse-slip offset—Identity and existence certain, location accurate	A-2-13 2.12.21
4886	Scarp on scissor fault, reverse-slip offset—Identity and existence certain, location approximate	A-2-13 2.12.23
4887	Scarp on scissor fault, reverse-slip offset—Identity or existence questionable, location accurate	A-2-13 2.12.22
4888	Scarp on scissor fault, reverse-slip offset—Identity or existence questionable, location	
4889	approximate	A-2-13 2.12.24
4890	Scarp on strike-slip fault, left-lateral offset—Identity and existence certain, location accurate	A-2-13 2.12.33
4891	Scarp on strike-slip fault, left-lateral offset—Identity and existence certain, location	
4892	approximate	A-2-13 2.12.35
4893	Scarp on strike-slip fault, left-lateral offset—Identity or existence questionable, location	
4894	accurate	A-2-13 2.12.34
4895	Scarp on strike-slip fault, left-lateral offset—Identity or existence questionable, location	
4896	approximate	A-2-13 2.12.36
4897	Scarp on strike-slip fault, right-lateral offset—Identity and existence certain, location accurate	A-2-13 2.12.29
4898	Scarp on strike-slip fault, right-lateral offset—Identity and existence certain, location	
4899	approximate	A-2-13 2.12.31
4900	Scarp on strike-slip fault, right-lateral offset—Identity or existence questionable, location	
4901	accurate	A-2-13 2.12.30
4902	Scarp on strike-slip fault, right-lateral offset—Identity or existence questionable, location	
4903	approximate	A-2-13 2.12.32
4904	Scarp on thrust fault (1st option)—Identity and existence certain, location accurate	A-2-14 2.12.45
4905	Scarp on thrust fault (1st option)—Identity and existence certain, location approximate	A-2-14 2.12.47
4906	Scarp on thrust fault (1st option)—Identity or existence questionable, location accurate	A-2-14 2.12.46
4907	Scarp on thrust fault (1st option)—Identity or existence questionable, location approximate	A-2-14 2.12.48
4908	Scarp on thrust fault (2nd option)—Identity and existence certain, location accurate	A-2-14 2.12.49
4909	Scarp on thrust fault (2nd option)—Identity and existence certain, location approximate	A-2-14 2.12.51

	<i>Page</i>	<i>Ref. No.</i>
4910		
4911	Scarp on thrust fault (2nd option)—Identity or existence questionable, location accurate	A-2-14 2.12.50
4912	Scarp on thrust fault (2nd option)—Identity or existence questionable, location approximate	A-2-14 2.12.52
4913	Scarp on thrust fault (3rd option)—Identity and existence certain, location accurate	A-2-14 2.12.53
4914	Scarp on thrust fault (3rd option)—Identity and existence certain, location approximate	A-2-14 2.12.55
4915	Scarp on thrust fault (3rd option)—Identity or existence questionable, location accurate	A-2-14 2.12.54
4916	Scarp on thrust fault (3rd option)—Identity or existence questionable, location approximate	A-2-14 2.12.56
4917	Scarp, planetary	A-25-4 25.71
4918	Scarps on faults	A-2-12 Sec. 2.12
4919	Scarps on fluvial terraces	A-12-1 Sec. 12
4920	Scarps on landslides	A-17-1 Sec. 17
4921	Scarps on sedimentary contacts	A-1-2 Sec. 1.1
4922	Schist	A-37-3 705
4923	Schist and gneiss	A-37-3 707
4924	Schistose granite	A-37-3 704
4925	Scientific confidence [concepts and definitions]	22 n/a
4926	Scientific confidence and locational accuracy of geologic features [concepts and definitions]	21 n/a
4927	Scissor fault, normal-slip offset—Identity and existence certain, location accurate	A-2-4 2.5.9
4928	Scissor fault, normal-slip offset—Identity and existence certain, location approximate	A-2-4 2.5.11
4929	Scissor fault, normal-slip offset—Identity and existence certain, location concealed	A-2-4 2.5.15
4930	Scissor fault, normal-slip offset—Identity and existence certain, location inferred	A-2-4 2.5.13
4931	Scissor fault, normal-slip offset—Identity or existence questionable, location accurate	A-2-4 2.5.10
4932	Scissor fault, normal-slip offset—Identity or existence questionable, location approximate	A-2-4 2.5.12
4933	Scissor fault, normal-slip offset—Identity or existence questionable, location concealed	A-2-4 2.5.16
4934	Scissor fault, normal-slip offset—Identity or existence questionable, location inferred	A-2-4 2.5.14
4935	Scissor fault, reverse-slip offset—Identity and existence certain, location accurate	A-2-4 2.5.1
4936	Scissor fault, reverse-slip offset—Identity and existence certain, location approximate	A-2-4 2.5.3
4937	Scissor fault, reverse-slip offset—Identity and existence certain, location concealed	A-2-4 2.5.7
4938	Scissor fault, reverse-slip offset—Identity and existence certain, location inferred	A-2-4 2.5.5
4939	Scissor fault, reverse-slip offset—Identity or existence questionable, location accurate	A-2-4 2.5.2
4940	Scissor fault, reverse-slip offset—Identity or existence questionable, location approximate	A-2-4 2.5.4
4941	Scissor fault, reverse-slip offset—Identity or existence questionable, location concealed	A-2-4 2.5.8
4942	Scissor fault, reverse-slip offset—Identity or existence questionable, location inferred	A-2-4 2.5.6
4943	Scissor faults	A-2-4 Sec. 2.5
4944	Scope [of this standard]	2 n/a
4945	Scour marks	A-9-1 Sec. 9
4946	Seamount, nonvolcanic origin	A-22-2 22.36
4947	Seamount, nonvolcanic origin (shown as point symbol when too small to outline at map scale)	A-22-2 22.38
4948	Seamount, volcanic origin	A-22-2 22.37
4949	Seamount, volcanic origin (shown as point symbol when too small to outline at map scale)	A-22-2 22.39
4950	Secondary crater field, planetary	A-25-6 25.122

	<i>Page</i>	<i>Ref. No.</i>
4951		
4952	Secondary foliation (caused by metamorphism or tectonism).....	A-8-3 Sec. 8.3
4953	Secondary highway, divided by centerline (Class 2)	A-28-1 28.7
4954	Secondary highway, divided by median strip (Class 2)	A-28-1 28.8
4955	Secondary highway, undivided (Class 2).....	A-28-1 28.6
4956	Secondary impact crater chain and cluster, planetary	A-25-5 25.99
4957	Secondary terrestrial impact crater (too small to draw to scale) (1st option).....	A-24-1 24.2
4958	Secondary terrestrial impact crater (too small to draw to scale) (2nd option).....	A-24-1 24.4
4959	Section line—Definite	A-31-1 31.5
4960	Section line—Location approximate.....	A-31-1 31.6
4961	Section number	A-31-1 31.7
4962	Sediment transport direction determined from crossbeds.....	A-12-1 12.7
4963	Sediment transport direction determined from flute casts.....	A-12-1 12.8
4964	Sediment transport direction determined from imbrication.....	A-12-1 12.6
4965	Sedimentary patterns (Series 200).....	Pattern Chart n/a
4966	Sedimentary-rock lithologic patterns	A-37-1 Sec. 37.1
4967	Seep on landslide	A-17-3 17.48
4968	Seismic reflection survey.....	A-3-1 Sec. 3
4969	Serif font [illustrated]	A-ii n/a
4970	Serpentine.....	A-37-3 710
4971	Shallow condensate well.....	A-19-9 19.5.76
4972	Shallow core.....	A-19-6 19.5.8
4973	Shallow disposal well.....	A-19-7 19.5.28
4974	Shallow dry hole.....	A-19-7 19.5.21
4975	Shallow gas and condensate well.....	A-19-10 19.5.86
4976	Shallow gas storage well	A-19-10 19.5.94
4977	Shallow gas well.....	A-19-8 19.5.54
4978	Shallow junked hole.....	A-19-7 19.5.24
4979	Shallow, linear depression, planetary.....	A-25-3 25.55
4980	Shallow, linear valley, planetary	A-25-3 25.55
4981	Shallow, narrow channel, planetary.....	A-25-3 25.55
4982	Shallow observation well for gas-storage field.....	A-19-10 19.5.100
4983	Shallow oil and gas well.....	A-19-9 19.5.66
4984	Shallow oil well.....	A-19-8 19.5.43
4985	Shallow salt-water disposal well	A-19-7 19.5.34
4986	Shaly dolomite	A-37-2 647
4987	Shaly dolostone	A-37-2 647
4988	Shaly limestone	A-37-1 638
4989	Shaly sandstone.....	A-37-1 612
4990	Shaly silt.....	A-37-1 616
4991	Sharp groove, planetary.....	A-25-3 25.48

	<i>Page</i>	<i>Ref. No.</i>
4992		
4993 Shear features in landslides	A-17-2	Sec. 17
4994 Shear zone	A-2-16	2.14.1
4995 Shear zones [concepts and definitions]	17	n/a
4996 Sheared rock within fault	A-2-16	2.14.2
4997 Sheath folds (antiformal)	A-5-5	Sec. 5.4
4998 Sheath folds (synformal)	A-5-10	Sec. 5.8
4999 Shoal	A-30-6	30.3.19
5000 Shoreline	A-30-5	30.2.29
5001 Shoreline, aggradational	A-15-1	Sec. 15
5002 Shoreline cliff—Identity and existence certain, location accurate	A-15-2	15.22
5003 Shoreline cliff—Identity and existence certain, location approximate	A-15-2	15.24
5004 Shoreline cliff—Identity or existence questionable, location accurate	A-15-2	15.23
5005 Shoreline cliff—Identity or existence questionable, location approximate	A-15-2	15.25
5006 Shoreline, erosional	A-15-1	Sec. 15
5007 Shoreline, former	A-15-1	Sec. 15
5008 Shut-in water well	A-26-1	26.1.4
5009 Siderite	A-37-2	665
5010 Significant glacial advance	A-13-3	Sec. 13
5011 Silicoflagellates	A-10-1	10.2.60
5012 Silt	A-37-1	616
5013 Siltstone	A-37-1	616
5014 Silty dolomite	A-37-2	646
5015 Silty dolostone	A-37-2	646
5016 Silty limestone	A-37-1	637
5017 Silty shale	A-37-1	619
5018 Silurian [geologic age symbol]	A-32-1	32.16
5019 Sinkhole (drawn to scale)	A-23-1	23.10
5020 Sinkhole, formed by shock—Identity and existence certain, location accurate	A-21-2	21.30
5021 Sinkhole, formed by shock—Identity or existence certain, location approximate	A-21-2	21.32
5022 Sinkhole, formed by shock—Identity or existence certain, location concealed	A-21-2	21.34
5023 Sinkhole, formed by shock—Identity or existence questionable, location accurate	A-21-2	21.31
5024 Sinkhole, formed by shock—Identity or existence questionable, location approximate	A-21-2	21.33
5025 Sinkhole, formed by shock—Identity or existence questionable, location concealed	A-21-2	21.35
5026 Sinkhole (too small to draw to scale)	A-23-1	23.9
5027 Siphon	A-30-4	30.2.23
5028 Size of map-unit areas [influencing color and pattern selection]	34	n/a
5029 Skylights (not mapped to scale) along lava tube	A-18-2	18.44
5030 Slate	A-37-3	703
5031 Slaty cleavage	A-7-1	Sec. 7
5032 Slickenlines	A-9-1	Sec. 9

	<i>Page</i>	<i>Ref. No.</i>
5033		
5034	Slide material, planetary	A-25-5 25.117
5035	Slip surface of landslide	A-17-1 17.9
5036	Sluice gate	A-30-4 30.2.14
5037	Slump, consisting of a relatively intact mass of displaced materials	A-17-3 17.62
5038	Slump material, planetary	A-25-5 25.117
5039	Small cinder cone	A-18-3 18.55
5040	Small cone	A-18-3 18.55
5041	Small dome, planetary (not mapped to scale)	A-25-4 25.77
5042	Small endogenic crater (mapped to scale), planetary	A-25-5 25.107
5043	Small endogenic crater, planetary	A-25-5 25.106
5044	Small hornito	A-18-3 18.57
5045	Small, minor anticline, inclined axial surface (1st option)	A-5-14 5.11.5
5046	Small, minor anticline, inclined axial surface (2nd option)	A-5-14 5.11.7
5047	Small, minor anticline, vertical or near-vertical axial surface (1st option)	A-5-14 5.11.4
5048	Small, minor anticline, vertical or near-vertical axial surface (2nd option)	A-5-14 5.11.6
5049	Small, minor antiform, inclined axial surface (1st option)	A-5-14 5.11.9
5050	Small, minor antiform, inclined axial surface (2nd option)	A-5-14 5.11.11
5051	Small, minor antiform, vertical or near-vertical axial surface (1st option)	A-5-14 5.11.8
5052	Small, minor antiform, vertical or near-vertical axial surface (2nd option)	A-5-14 5.11.10
5053	Small, minor asymmetric anticline, inclined axial surface (1st option)	A-5-14 5.11.13
5054	Small, minor asymmetric anticline, inclined axial surface (2nd option)	A-5-14 5.11.15
5055	Small, minor asymmetric anticline, vertical or near-vertical axial surface (1st option)	A-5-14 5.11.12
5056	Small, minor asymmetric anticline, vertical or near-vertical axial surface (2nd option)	A-5-14 5.11.14
5057	Small, minor asymmetric syncline, inclined axial surface (1st option)	A-5-15 5.11.33
5058	Small, minor asymmetric syncline, inclined axial surface (2nd option)	A-5-15 5.11.35
5059	Small, minor asymmetric syncline, vertical or near-vertical axial surface (1st option)	A-5-15 5.11.32
5060	Small, minor asymmetric syncline, vertical or near-vertical axial surface (2nd option)	A-5-15 5.11.34
5061	Small, minor basin	A-5-14 5.11.3
5062	Small, minor dome	A-5-14 5.11.2
5063	Small, minor faults	A-2-16 Sec. 2.15
5064	Small, minor fold, horizontal axial surface	A-5-14 5.11.1
5065	Small, minor folds	A-5-14 Sec. 5.11
5066	Small, minor horizontal joint (1st option)	A-4-1 4.3.1
5067	Small, minor horizontal joint (2nd option)	A-4-1 4.3.7
5068	Small, minor inclined (dip direction to left) joint, for multiple observations at one locality (1st	
5069	option)	A-4-1 4.3.5
5070	Small, minor inclined (dip direction to left) joint, for multiple observations at one locality (2nd	
5071	option)	A-4-1 4.3.11
5072	Small, minor inclined (dip direction to right) joint, for multiple observations at one locality (1st	
5073	option)	A-4-1 4.3.4

	<i>Page</i>	<i>Ref. No.</i>
5074		
5075	Small, minor inclined (dip direction to right) joint, for multiple observations at one locality (2nd	
5076	option).....	A-4-1 4.3.10
5077	Small, minor inclined fault.....	A-2-16 2.15.1
5078	Small, minor inclined joint (1st option).....	A-4-1 4.3.2
5079	Small, minor inclined joint (2nd option).....	A-4-1 4.3.8
5080	Small, minor inclined mineralized stringer.....	A-19-1 19.1.12
5081	Small, minor inclined vein.....	A-19-1 19.1.12
5082	Small, minor inclined veinlet.....	A-19-1 19.1.12
5083	Small, minor inverted anticline, inclined axial surface (1st option).....	A-5-14 5.11.21
5084	Small, minor inverted anticline, inclined axial surface (2nd option).....	A-5-14 5.11.23
5085	Small, minor inverted anticline, vertical or near-vertical axial surface (1st option).....	A-5-14 5.11.20
5086	Small, minor inverted anticline, vertical or near-vertical axial surface (2nd option).....	A-5-14 5.11.22
5087	Small, minor inverted syncline, inclined axial surface (1st option).....	A-5-15 5.11.41
5088	Small, minor inverted syncline, inclined axial surface (2nd option).....	A-5-15 5.11.43
5089	Small, minor inverted syncline, vertical or near-vertical axial surface (1st option).....	A-5-15 5.11.40
5090	Small, minor inverted syncline, vertical or near-vertical axial surface (2nd option).....	A-5-15 5.11.42
5091	Small, minor joints.....	A-4-1 Sec. 4.3
5092	Small, minor overturned anticline, inclined axial surface (1st option).....	A-5-14 5.11.17
5093	Small, minor overturned anticline, inclined axial surface (2nd option).....	A-5-14 5.11.19
5094	Small, minor overturned anticline, vertical or near-vertical axial surface (1st option).....	A-5-14 5.11.16
5095	Small, minor overturned anticline, vertical or near-vertical axial surface (2nd option).....	A-5-14 5.11.18
5096	Small, minor overturned syncline, inclined axial surface (1st option).....	A-5-15 5.11.37
5097	Small, minor overturned syncline, inclined axial surface (2nd option).....	A-5-15 5.11.39
5098	Small, minor overturned syncline, vertical or near-vertical axial surface (1st option).....	A-5-15 5.11.36
5099	Small, minor overturned syncline, vertical or near-vertical axial surface (2nd option).....	A-5-15 5.11.38
5100	Small, minor shear fault.....	A-2-16 2.15.3
5101	Small, minor syncline, inclined axial surface (1st option).....	A-5-15 5.11.25
5102	Small, minor syncline, inclined axial surface (2nd option).....	A-5-15 5.11.27
5103	Small, minor syncline, vertical or near-vertical axial surface (1st option).....	A-5-15 5.11.24
5104	Small, minor syncline, vertical or near-vertical axial surface (2nd option).....	A-5-15 5.11.26
5105	Small, minor synform, inclined axial surface (1st option).....	A-5-15 5.11.29
5106	Small, minor synform, inclined axial surface (2nd option).....	A-5-15 5.11.31
5107	Small, minor synform, vertical or near-vertical axial surface (1st option).....	A-5-15 5.11.28
5108	Small, minor synform, vertical or near-vertical axial surface (2nd option).....	A-5-15 5.11.30
5109	Small, minor vertical or near-vertical fault.....	A-2-16 2.15.2
5110	Small, minor vertical or near-vertical joint (1st option).....	A-4-1 4.3.3
5111	Small, minor vertical or near-vertical joint (2nd option).....	A-4-1 4.3.9
5112	Small, minor vertical or near-vertical joint, for multiple observations at one locality (1st option).....	A-4-1 4.3.6
5113	Small, minor vertical or near-vertical joint, for multiple observations at one locality (2nd	
5114	option).....	A-4-1 4.3.12

	<i>Page</i>	<i>Ref. No.</i>
5115		
5116	Small, minor vertical or near-vertical mineralized stringer	A-19-1 19.1.13
5117	Small, minor vertical or near-vertical vein	A-19-1 19.1.13
5118	Small, minor vertical or near-vertical veinlet	A-19-1 19.1.13
5119	Small park boundary	A-29-1 29.7
5120	Small shield, planetary (not mapped to scale)	A-25-4 25.77
5121	Small spatter cone	A-18-3 18.55
5122	Small tholi, planetary (mapped to scale)	A-25-4 25.90
5123	Small tholi, planetary (not mapped to scale)	A-25-4 25.89
5124	Small vent	A-18-3 18.55
5125	Small volcanic construct, planetary (not mapped to scale)	A-25-4 25.77
5126	Smaller, benthonic foraminifera	A-10-1 10.2.50
5127	Smaller, planktonic foraminifera	A-10-1 10.2.51
5128	Snow-survey course, equipped with a recorder	A-27-1 27.4
5129	Snow-survey course, equipped with a telephone or radio	A-27-1 27.3
5130	Soapstone	A-37-3 710
5131	Soil creep on landslide	A-17-3 17.47
5132	Sole marks	A-9-1 Sec. 9
5133	Solid, continuous line symbol [concepts and definitions]	32 n/a
5134	Solifluction lobes	A-14-1 14.7
5135	Sorted circles	A-14-1 14.4
5136	South Carolina [state location map]	A-34-2 Sec. 34.1
5137	South Dakota [state location map]	A-34-2 Sec. 34.1
5138	Souvenir [font]	38 n/a
5139	Spaced cleavage	A-7-1 Sec. 7
5140	Spaced foliation	A-8-4 Sec. 8.3
5141	Spatter cone, large	A-18-3 18.56
5142	Spatter cone, small	A-18-3 18.55
5143	Spatter rampart	A-18-3 18.59
5144	Specialized planar-feature point symbols for multiple observations at one locality [concepts and	
5145	definitions]	19 n/a
5146	Specifying color for line symbols	37 n/a
5147	Specifying color for map-unit areas	35 n/a
5148	Specifying color for point symbols	37 n/a
5149	Specifying positional accuracy with the zone of confidence [concepts and definitions]	28 n/a
5150	Spicules	A-10-1 10.2.61
5151	Spillway, glacial lake	A-13-1 13.3
5152	Spit—Identity and existence certain, location accurate	A-15-2 15.26
5153	Spit—Identity and existence certain, location approximate	A-15-2 15.28
5154	Spit—Identity or existence questionable, location accurate	A-15-2 15.27
5155	Spit—Identity or existence questionable, location approximate	A-15-2 15.29

	<i>Page</i>	<i>Ref. No.</i>
5156		
5157	Splotch, planetary..... A-25-6	25.130
5158	Sponges A-10-1	10.2.25
5159	Spot color specifications used in this standard and their equivalent colors in other color models A-v	Table 3
5160	Spot colors [in this standard]..... A-v	Table 3
5161	Spreading axes A-22-1	Sec. 22
5162	Spring, as shown on topographic maps or on general-purpose or smaller scale maps A-30-6	30.3.12
5163	Spring on landslide A-17-3	17.48
5164	Spring, type of use unspecified A-26-4	26.2.1
5165	Spring used for collection of water-quality data..... A-26-4	26.2.3
5166	Spring used for domestic-water supply..... A-26-4	26.2.4
5167	Spring used for industrial-water supply A-26-4	26.2.16
5168	Spring used for irrigation-water supply..... A-26-4	26.2.12
5169	Spring used for public-water supply A-26-4	26.2.20
5170	Spring used for stock-water supply A-26-4	26.2.8
5171	Springs A-26-4	Sec. 26.2
5172	Stage boundary..... A-31-1	31.23
5173	Stage-measurement site without a gage A-26-5	26.3.17
5174	Stagnant ice margin A-13-3	Sec. 13
5175	Standards development procedures 3	n/a
5176	State boundary A-29-1	29.2
5177	State forest boundary..... A-29-1	29.6
5178	State grassland boundary A-29-1	29.6
5179	State location maps..... A-34-1	Sec. 34
5180	State monument boundary..... A-29-1	29.6
5181	State park boundary A-29-1	29.6
5182	State reservation boundary A-29-1	29.6
5183	State route marker A-28-1	28.18
5184	State wilderness area boundary A-29-1	29.6
5185	State wildlife refuge boundary..... A-29-1	29.6
5186	Steam vent..... A-18-3	18.64
5187	Steep-sided edifice, planetary (not mapped to scale) A-25-4	25.85
5188	Steep-sided edifice, planetary (not mapped to scale)—Concealed or buried..... A-25-4	25.86
5189	Steeply inclined (between 60° and 90°) bedding, as determined remotely or from aerial	
5190	photographs..... A-6-2	6.42
5191	Steeply overturned (between 60° and 90°) bedding, as determined remotely or from aerial	
5192	photographs..... A-6-2	6.46
5193	Stone stripe, coarse debris..... A-14-1	14.6
5194	Stone stripe, fine debris..... A-14-1	14.5
5195	Stoped area (drawn to scale), as shown on subsurface exploration maps (section view)..... A-19-5	19.4.17
5196	Strategies for map labeling 37	n/a

	<i>Page</i>	<i>Ref. No.</i>
5197		
5198	Stratigraphic units [concepts and definitions]	12 n/a
5199	Streams.....	A-30-4 Sec. 30.2
5200	Street (generic).....	A-28-1 28.2
5201	Street in urban area; light-duty road, composition unspecified (Class 3)	A-28-1 28.12
5202	Streets	A-28-1 Sec. 28
5203	Striations, glacial	A-13-2 Sec. 13
5204	Striations on fault surface	A-9-1 Sec. 9
5205	Strike [concepts and definitions]	18 n/a
5206	Strike-slip fault (in cross section) (1st option: A, away from observer; T, toward observer)	A-2-11 2.11.20
5207	Strike-slip fault (in cross section) (2nd option: minus, away from observer; plus, toward	
5208	observer)	A-2-11 2.11.21
5209	Strike-slip fault, left-lateral offset—Identity and existence certain, location accurate.....	A-2-5 2.6.9
5210	Strike-slip fault, left-lateral offset—Identity and existence certain, location approximate.....	A-2-5 2.6.11
5211	Strike-slip fault, left-lateral offset—Identity and existence certain, location concealed.....	A-2-5 2.6.15
5212	Strike-slip fault, left-lateral offset—Identity and existence certain, location inferred	A-2-5 2.6.13
5213	Strike-slip fault, left-lateral offset—Identity or existence questionable, location accurate.....	A-2-5 2.6.10
5214	Strike-slip fault, left-lateral offset—Identity or existence questionable, location approximate.....	A-2-5 2.6.12
5215	Strike-slip fault, left-lateral offset—Identity or existence questionable, location concealed.....	A-2-5 2.6.16
5216	Strike-slip fault, left-lateral offset—Identity or existence questionable, location inferred	A-2-5 2.6.14
5217	Strike-slip fault, planetary, left-lateral offset—Location accurate	A-25-1 25.17
5218	Strike-slip fault, planetary, left-lateral offset—Location approximate	A-25-1 25.18
5219	Strike-slip fault, planetary, left-lateral offset—Location concealed	A-25-1 25.20
5220	Strike-slip fault, planetary, left-lateral offset—Location inferred	A-25-1 25.19
5221	Strike-slip fault, planetary, right-lateral offset—Location accurate	A-25-1 25.13
5222	Strike-slip fault, planetary, right-lateral offset—Location approximate	A-25-1 25.14
5223	Strike-slip fault, planetary, right-lateral offset—Location concealed	A-25-1 25.16
5224	Strike-slip fault, planetary, right-lateral offset—Location inferred.....	A-25-1 25.15
5225	Strike-slip fault, right-lateral offset—Identity and existence certain, location accurate	A-2-5 2.6.1
5226	Strike-slip fault, right-lateral offset—Identity and existence certain, location approximate	A-2-5 2.6.3
5227	Strike-slip fault, right-lateral offset—Identity and existence certain, location concealed	A-2-5 2.6.7
5228	Strike-slip fault, right-lateral offset—Identity and existence certain, location inferred.....	A-2-5 2.6.5
5229	Strike-slip fault, right-lateral offset—Identity or existence questionable, location accurate	A-2-5 2.6.2
5230	Strike-slip fault, right-lateral offset—Identity or existence questionable, location approximate.....	A-2-5 2.6.4
5231	Strike-slip fault, right-lateral offset—Identity or existence questionable, location concealed	A-2-5 2.6.8
5232	Strike-slip fault, right-lateral offset—Identity or existence questionable, location inferred.....	A-2-5 2.6.6
5233	Strike-slip faults	A-2-5 Sec. 2.6
5234	Strip mine (1st option)	A-19-2 19.2.2
5235	Strip mine (2nd option)	A-19-2 19.2.3
5236	Stromatolites	A-10-1 10.2.39
5237	Stromatoporoids	A-10-1 10.2.13

	<i>Page</i>	<i>Ref. No.</i>
5238		
5239	Structural control point (1st surface)..... A-11-1	11.22
5240	Structural control point (2nd surface)..... A-11-2	11.32
5241	Structural control point (3rd surface) A-11-2	11.42
5242	Structure contour, 1st surface (index)—Accurately located..... A-11-1	11.13
5243	Structure contour, 1st surface (index)—Approximately located..... A-11-1	11.16
5244	Structure contour, 1st surface (intermediate)—Accurately located..... A-11-1	11.18
5245	Structure contour, 1st surface (intermediate)—Approximately located..... A-11-1	11.20
5246	Structure contour, 1st surface (index), showing datum..... A-11-1	11.14
5247	Structure contour, 2nd surface (index)—Accurately located..... A-11-2	11.23
5248	Structure contour, 2nd surface (index)—Approximately located..... A-11-2	11.26
5249	Structure contour, 2nd surface (intermediate)—Accurately located..... A-11-2	11.28
5250	Structure contour, 2nd surface (index), showing datum..... A-11-2	11.24
5251	Structure contour, 2nd surface (intermediate)—Approximately located..... A-11-2	11.30
5252	Structure contour, 3rd surface (index)—Accurately located..... A-11-2	11.33
5253	Structure contour, 3rd surface (index)—Approximately located..... A-11-2	11.36
5254	Structure contour, 3rd surface (intermediate)—Accurately located..... A-11-2	11.38
5255	Structure contour, 3rd surface (intermediate)—Approximately located..... A-11-2	11.40
5256	Structure contour, 3rd surface (index), showing datum..... A-11-2	11.34
5257	Structure contour around closed area of lower values, 1st surface (index)—Accurately located..... A-11-1	11.15
5258	Structure contour around closed area of lower values, 1st surface (index)—Approximately	
5259	located..... A-11-1	11.17
5260	Structure contour around closed area of lower values, 1st surface (intermediate)—Accurately	
5261	located..... A-11-1	11.19
5262	Structure contour around closed area of lower values, 1st surface (intermediate)—Approximately	
5263	located..... A-11-1	11.21
5264	Structure contour around closed area of lower values, 2nd surface (index)—Accurately located..... A-11-2	11.25
5265	Structure contour around closed area of lower values, 2nd surface (index)—Approximately	
5266	located..... A-11-2	11.27
5267	Structure contour around closed area of lower values, 2nd surface (intermediate)—Accurately	
5268	located..... A-11-2	11.29
5269	Structure contour around closed area of lower values, 2nd surface (intermediate)—Approximately	
5270	located..... A-11-2	11.31
5271	Structure contour around closed area of lower values, 3rd surface (index)—Accurately located..... A-11-2	11.35
5272	Structure contour around closed area of lower values, 3rd surface (index)—Approximately	
5273	located..... A-11-2	11.37
5274	Structure contour around closed area of lower values, 3rd surface (intermediate)—Accurately	
5275	located..... A-11-2	11.39
5276	Structure contour around closed area of lower values, 3rd surface (intermediate)—Approximately	
5277	located..... A-11-2	11.41
5278	Structure contour (index), as shown on hydrologic maps, showing altitude of top or base of, or	
5279	horizon within, stratigraphic unit, aquifer, or confining bed—Accurately located..... A-26-7	26.5.1

	<i>Page</i>	<i>Ref. No.</i>
5280		
5281	Structure contour (index), as shown on hydrologic maps, showing altitude of top or base of, or	
5282	horizon within, stratigraphic unit, aquifer, or confining bed—Approximately located.....	A-26-7 26.5.2
5283	Structure contour (intermediate), as shown on hydrologic maps, showing altitude of top or base	
5284	of, or horizon within, stratigraphic unit, aquifer, or confining bed—Accurately located.....	A-26-7 26.5.3
5285	Structure contour (intermediate), as shown on hydrologic maps, showing altitude of top or base	
5286	of, or horizon within, stratigraphic unit, aquifer, or confining bed—Approximately located.....	A-26-7 26.5.4
5287	Structure contours	A-11-1 Sec. 11
5288	Subduction zones	A-22-1 Sec. 22
5289	Subdued groove, planetary	A-25-3 25.49
5290	Subdued impact crater rim, planetary.....	A-25-5 25.98
5291	Subgraywacke.....	A-37-2 654
5292	Subsidence caused by shock—Identity and existence certain, location accurate	A-21-1 21.16
5293	Subsidence caused by shock—Identity and existence certain, location concealed	A-21-1 21.22
5294	Subsidence caused by shock—Identity or existence certain, location approximate	A-21-1 21.18
5295	Subsidence caused by shock—Identity or existence certain, location inferred	A-21-1 21.20
5296	Subsidence caused by shock—Identity or existence questionable, location accurate	A-21-1 21.17
5297	Subsidence caused by shock—Identity or existence questionable, location approximate.....	A-21-1 21.19
5298	Subsidence caused by shock—Identity or existence questionable, location concealed.....	A-21-1 21.23
5299	Subsidence caused by shock—Identity or existence questionable, location inferred	A-21-1 21.21
5300	Subsurface workings, as shown on subsurface exploration maps.....	A-19-5 Sec. 19.4
5301	Subsurface workings, projected to surface (1st option)	A-19-2 19.2.10
5302	Subsurface workings, projected to surface (2nd option)	A-19-2 19.2.11
5303	Subsurface workings, projected to surface (3rd option).....	A-19-2 19.2.12
5304	Subsurface workings, projected to surface (4th option).....	A-19-2 19.2.13
5305	Subsurface workings, projected to surface (5th option).....	A-19-2 19.2.14
5306	Subsurface workings, projected to surface (6th option).....	A-19-2 19.2.15
5307	Subvertical faults	A-2-1 Sec. 2.1
5308	Suggested map-unit colors for plutonic rocks	A-33-1 Sec. 33.1
5309	Suggested map-unit colors for stratigraphic ages of metamorphic rocks	A-33-1 Sec. 33.2
5310	Suggested map-unit colors for stratigraphic ages of sedimentary rocks	A-33-1 Sec. 33.2
5311	Suggested map-unit colors for volcanic rocks.....	A-33-1 Sec. 33.1
5312	Suggested ranges of map-unit colors for volcanic and plutonic rocks and for stratigraphic ages of	
5313	sedimentary and metamorphic rocks.....	A-33-1 Sec. 33
5314	Superficial crater material having weak radar backscatter coefficient, planetary.....	A-25-6 25.133
5315	Supplementary bathymetric contour	A-30-2 30.1.25
5316	Supplementary bathymetric contour—Approximate	A-30-2 30.1.26
5317	Supplementary bathymetric depression contour.....	A-30-2 30.1.35
5318	Supplementary bathymetric rise contour (inside depression).....	A-30-2 30.1.36
5319	Supplementary topographic contour (1st option).....	A-30-1 30.1.5
5320	Supplementary topographic contour (1st option)—Approximate or indefinite	A-30-1 30.1.6

	<i>Page</i>	<i>Ref. No.</i>
5321		
5322	Supplementary topographic contour (2nd option)..... A-30-1	30.1.15
5323	Supplementary topographic contour (2nd option)—Approximate or indefinite A-30-1	30.1.16
5324	Supplementary topographic depression contour (1st option)..... A-30-1	30.1.9
5325	Supplementary topographic depression contour (2nd option)..... A-30-1	30.1.19
5326	Surface grooves..... A-9-1	Sec. 9
5327	Surface striations A-9-1	Sec. 9
5328	Surface trace of active deep-seismofocal zone—Accurately located..... A-22-1	22.7
5329	Surface trace of active deep-seismofocal zone—Approximately located..... A-22-1	22.8
5330	Surface trace of active deep-seismofocal zone, showing fore-arc sediments..... A-22-1	22.9
5331	Surface trace of active subduction zone—Accurately located..... A-22-1	22.7
5332	Surface trace of active subduction zone—Approximately located..... A-22-1	22.8
5333	Surface trace of active subduction zone, showing fore-arc sediments A-22-1	22.9
5334	Surface-water basin boundary A-26-9	26.7.1
5335	Surface-water subbasin boundary A-26-9	26.7.2
5336	Surface workings A-19-2	Sec. 19.2
5337	Surficial patterns (Series 100) Pattern Chart	n/a
5338	Survey station A-3-1	3.3.5
5339	Suspended condensate well (nonspecific depth) A-19-9	19.5.74
5340	Suspended deep condensate well A-19-9	19.5.80
5341	Suspended deep gas and condensate well A-19-10	19.5.90
5342	Suspended deep gas well A-19-8	19.5.58
5343	Suspended deep oil and gas well A-19-9	19.5.70
5344	Suspended deep oil well A-19-8	19.5.47
5345	Suspended gas and condensate well (nonspecific depth)..... A-19-10	19.5.84
5346	Suspended gas well (nonspecific depth)..... A-19-8	19.5.52
5347	Suspended oil and gas well (nonspecific depth)..... A-19-9	19.5.64
5348	Suspended oil well (nonspecific depth)..... A-19-8	19.5.41
5349	Suspended shallow condensate well A-19-9	19.5.77
5350	Suspended shallow gas and condensate well A-19-10	19.5.87
5351	Suspended shallow gas well..... A-19-8	19.5.55
5352	Suspended shallow oil and gas well..... A-19-9	19.5.67
5353	Suspended shallow oil well A-19-8	19.5.44
5354	Swamp A-30-5	30.2.46
5355	Symbol explanation [on map sheet]..... A-iii	n/a
5356	Synclinal linear depression on landslide..... A-17-2	17.42
5357	Synclinal soft-sediment fold on landslide A-17-2	17.42
5358	Syncline (1st option)—Identity and existence certain, location accurate A-5-6	5.5.1
5359	Syncline (1st option)—Identity and existence certain, location approximate A-5-6	5.5.3
5360	Syncline (1st option)—Identity and existence certain, location concealed A-5-6	5.5.7
5361	Syncline (1st option)—Identity and existence certain, location inferred..... A-5-6	5.5.5

	<i>Page</i>	<i>Ref. No.</i>
5362		
5363	Syncline (1st option)—Identity or existence questionable, location accurate..... A-5-6	5.5.2
5364	Syncline (1st option)—Identity or existence questionable, location approximate..... A-5-6	5.5.4
5365	Syncline (1st option)—Identity or existence questionable, location concealed..... A-5-6	5.5.8
5366	Syncline (1st option)—Identity or existence questionable, location inferred A-5-6	5.5.6
5367	Syncline (2nd option)—Identity and existence certain, location accurate A-5-6	5.5.9
5368	Syncline (2nd option)—Identity and existence certain, location approximate A-5-6	5.5.11
5369	Syncline (2nd option)—Identity and existence certain, location concealed..... A-5-6	5.5.15
5370	Syncline (2nd option)—Identity and existence certain, location inferred..... A-5-6	5.5.13
5371	Syncline (2nd option)—Identity or existence questionable, location accurate..... A-5-6	5.5.10
5372	Syncline (2nd option)—Identity or existence questionable, location approximate..... A-5-6	5.5.12
5373	Syncline (2nd option)—Identity or existence questionable, location concealed..... A-5-6	5.5.16
5374	Syncline (2nd option)—Identity or existence questionable, location inferred A-5-6	5.5.14
5375	Synclines..... A-5-6	Sec. 5.5
5376	Synform (1st option)—Identity and existence certain, location accurate A-5-7	5.6.1
5377	Synform (1st option)—Identity and existence certain, location approximate..... A-5-7	5.6.3
5378	Synform (1st option)—Identity and existence certain, location concealed A-5-7	5.6.7
5379	Synform (1st option)—Identity and existence certain, location inferred..... A-5-7	5.6.5
5380	Synform (1st option)—Identity or existence questionable, location accurate..... A-5-7	5.6.2
5381	Synform (1st option)—Identity or existence questionable, location approximate..... A-5-7	5.6.4
5382	Synform (1st option)—Identity or existence questionable, location concealed..... A-5-7	5.6.8
5383	Synform (1st option)—Identity or existence questionable, location inferred A-5-7	5.6.6
5384	Synform (2nd option)—Identity and existence certain, location accurate A-5-7	5.6.9
5385	Synform (2nd option)—Identity and existence certain, location approximate..... A-5-7	5.6.11
5386	Synform (2nd option)—Identity and existence certain, location concealed..... A-5-7	5.6.15
5387	Synform (2nd option)—Identity and existence certain, location inferred..... A-5-7	5.6.13
5388	Synform (2nd option)—Identity or existence questionable, location accurate..... A-5-7	5.6.10
5389	Synform (2nd option)—Identity or existence questionable, location approximate..... A-5-7	5.6.12
5390	Synform (2nd option)—Identity or existence questionable, location concealed..... A-5-7	5.6.16
5391	Synform (2nd option)—Identity or existence questionable, location inferred A-5-7	5.6.14
5392	Synformal sheath fold (1st option)—Identity and existence certain, location accurate..... A-5-10	5.8.1
5393	Synformal sheath fold (1st option)—Identity and existence certain, location approximate..... A-5-10	5.8.3
5394	Synformal sheath fold (1st option)—Identity and existence certain, location concealed..... A-5-10	5.8.7
5395	Synformal sheath fold (1st option)—Identity and existence certain, location inferred A-5-10	5.8.5
5396	Synformal sheath fold (1st option)—Identity or existence questionable, location accurate..... A-5-10	5.8.2
5397	Synformal sheath fold (1st option)—Identity or existence questionable, location approximate..... A-5-10	5.8.4
5398	Synformal sheath fold (1st option)—Identity or existence questionable, location concealed..... A-5-10	5.8.8
5399	Synformal sheath fold (1st option)—Identity or existence questionable, location inferred A-5-10	5.8.6
5400	Synformal sheath fold (2nd option)—Identity and existence certain, location accurate..... A-5-10	5.8.9
5401	Synformal sheath fold (2nd option)—Identity and existence certain, location approximate..... A-5-10	5.8.11
5402	Synformal sheath fold (2nd option)—Identity and existence certain, location concealed..... A-5-10	5.8.15

	<i>Page</i>	<i>Ref. No.</i>
5403		
5404	Synformal sheath fold (2nd option)—Identity and existence certain, location inferred A-5-10	5.8.13
5405	Synformal sheath fold (2nd option)—Identity or existence questionable, location accurate..... A-5-10	5.8.10
5406	Synformal sheath fold (2nd option)—Identity or existence questionable, location approximate..... A-5-10	5.8.12
5407	Synformal sheath fold (2nd option)—Identity or existence questionable, location concealed..... A-5-10	5.8.16
5408	Synformal sheath fold (2nd option)—Identity or existence questionable, location inferred A-5-10	5.8.14
5409	Synformal sheath folds..... A-5-10	Sec. 5.8
5410	Synforms..... A-5-7	Sec. 5.6
5411		
5412	Tailings..... A-19-2	19.2.6
5413	Tailings pond..... A-30-5	30.2.43
5414	Talc A-37-3	710
5415	TBI [abbreviation]..... A-v	Table 2
5416	Technical specifications used in the preparation of this standard..... 39	n/a
5417	Tectonic foliation..... A-8-3	Sec. 8.3
5418	Telephone line A-30-6	30.3.22
5419	Tennessee [state location map] A-34-2	Sec. 34.1
5420	Tension crack on landslide (1st option) A-17-2	17.35
5421	Tension crack on landslide (2nd option) A-17-2	17.36
5422	Tension crack on landslide (3rd option) A-17-2	17.37
5423	Tension fracture on landslide (1st option)..... A-17-2	17.35
5424	Tension fracture on landslide (2nd option)..... A-17-2	17.36
5425	Tension fracture on landslide (3rd option) A-17-2	17.37
5426	Terminus of glacier..... A-13-3	Sec. 13
5427	Terrace deposits, planetary A-25-6	25.120
5428	Terrestrial impact crater with raised rim—Identity and existence certain, location accurate A-24-1	24.11
5429	Terrestrial impact crater with raised rim—Identity or existence certain, location approximate A-24-1	24.13
5430	Terrestrial impact crater with raised rim—Identity or existence certain, location concealed A-24-1	24.15
5431	Terrestrial impact crater with raised rim—Identity or existence questionable, location accurate A-24-1	24.12
5432	Terrestrial impact crater with raised rim—Identity or existence questionable, location	
5433	approximate A-24-1	24.14
5434	Terrestrial impact crater with raised rim—Identity or existence questionable, location concealed A-24-1	24.16
5435	Terrestrial impact crater without raised rim—Identity and existence certain, location accurate A-24-1	24.5
5436	Terrestrial impact crater without raised rim—Identity and existence certain, location concealed A-24-1	24.9
5437	Terrestrial impact crater without raised rim—Identity or existence certain, location approximate A-24-1	24.7
5438	Terrestrial impact crater without raised rim—Identity or existence questionable, location	
5439	accurate A-24-1	24.6
5440	Terrestrial impact crater without raised rim—Identity or existence questionable, location	
5441	approximate A-24-1	24.8
5442	Terrestrial impact crater without raised rim—Identity or existence questionable, location	
5443	concealed A-24-1	24.10

	<i>Page</i>	<i>Ref. No.</i>
5444		
5445	Terrestrial impact features..... A-24-1	Sec. 24
5446	Terrestrial palimpsest area..... A-24-1	24.19
5447	Territory boundary A-29-1	29.2
5448	Tertiary [geologic age symbol] A-32-1	32.3
5449	Test hole for well used for domestic-water supply..... A-26-1	26.1.15
5450	Test hole for well used for industrial-water supply A-26-2	26.1.42
5451	Test hole for well used for irrigation-water supply A-26-2	26.1.33
5452	Test hole for well used for public-water supply A-26-3	26.1.51
5453	Test hole for well used for stock-water supply A-26-1	26.1.24
5454	Texas [state location map]..... A-34-2	Sec. 34.1
5455	Thermal area A-18-3	18.61
5456	Thermal spring..... A-18-3	18.62
5457	Thermal spring, as shown on topographic maps or on general-purpose or smaller scale maps..... A-30-6	30.3.13
5458	Thermal spring used for domestic-water supply A-26-4	26.2.5
5459	Thermal spring used for industrial-water supply A-26-4	26.2.17
5460	Thermal spring used for irrigation-water supply A-26-4	26.2.13
5461	Thermal spring used for public-water supply..... A-26-4	26.2.21
5462	Thermal spring used for stock-water supply A-26-4	26.2.9
5463	Thermokarst depression A-14-1	14.11
5464	Thickness of bed of economically important commodity and location where thickness was	
5465	measured..... A-1-6	1.4.11
5466	Thickness of clay bed and location where thickness was measured..... A-1-6	1.4.11
5467	Thickness of coal bed and location where thickness was measured..... A-1-6	1.4.11
5468	Thickness of dike and location where thickness was measured..... A-1-6	1.4.11
5469	Thickness of key bed and location where thickness was measured..... A-1-6	1.4.11
5470	Thrust fault (1st option)—Identity and existence certain, location accurate A-2-7	2.8.1
5471	Thrust fault (1st option)—Identity and existence certain, location approximate A-2-7	2.8.3
5472	Thrust fault (1st option)—Identity and existence certain, location concealed A-2-7	2.8.7
5473	Thrust fault (1st option)—Identity and existence certain, location inferred..... A-2-7	2.8.5
5474	Thrust fault (1st option)—Identity or existence questionable, location accurate A-2-7	2.8.2
5475	Thrust fault (1st option)—Identity or existence questionable, location approximate A-2-7	2.8.4
5476	Thrust fault (1st option)—Identity or existence questionable, location concealed A-2-7	2.8.8
5477	Thrust fault (1st option)—Identity or existence questionable, location inferred..... A-2-7	2.8.6
5478	Thrust fault (2nd option)—Identity and existence certain, location accurate A-2-7	2.8.9
5479	Thrust fault (2nd option)—Identity and existence certain, location approximate A-2-7	2.8.11
5480	Thrust fault (2nd option)—Identity and existence certain, location concealed A-2-7	2.8.15
5481	Thrust fault (2nd option)—Identity and existence certain, location inferred..... A-2-7	2.8.13
5482	Thrust fault (2nd option)—Identity or existence questionable, location accurate A-2-7	2.8.10
5483	Thrust fault (2nd option)—Identity or existence questionable, location approximate A-2-7	2.8.12
5484	Thrust fault (2nd option)—Identity or existence questionable, location concealed A-2-7	2.8.16

	<i>Page</i>	<i>Ref. No.</i>
5485		
5486 Thrust fault (2nd option)—Identity or existence questionable, location inferred.....	A-2-7	2.8.14
5487 Thrust fault (3rd option)—Identity and existence certain, location accurate.....	A-2-7	2.8.17
5488 Thrust fault (3rd option)—Identity and existence certain, location approximate.....	A-2-7	2.8.19
5489 Thrust fault (3rd option)—Identity and existence certain, location concealed.....	A-2-7	2.8.23
5490 Thrust fault (3rd option)—Identity and existence certain, location inferred.....	A-2-7	2.8.21
5491 Thrust fault (3rd option)—Identity or existence questionable, location accurate.....	A-2-7	2.8.18
5492 Thrust fault (3rd option)—Identity or existence questionable, location approximate.....	A-2-7	2.8.20
5493 Thrust fault (3rd option)—Identity or existence questionable, location concealed.....	A-2-7	2.8.24
5494 Thrust fault (3rd option)—Identity or existence questionable, location inferred.....	A-2-7	2.8.22
5495 Thrust fault (on small-scale maps or figures).....	A-2-11	2.11.24
5496 Thrust fault or reverse fault (in cross section).....	A-2-11	2.11.17
5497 Thrust fault, planetary—Location accurate.....	A-25-1	25.21
5498 Thrust fault, planetary—Location approximate.....	A-25-1	25.22
5499 Thrust fault, planetary—Location concealed.....	A-25-1	25.24
5500 Thrust fault, planetary—Location inferred.....	A-25-1	25.23
5501 Thrust faults.....	A-2-7	Sec. 2.8
5502 Thrust faults in landslides.....	A-17-2	Sec. 17
5503 TI [abbreviation].....	A-v	Table 2
5504 Tidegate.....	A-30-4	30.2.13
5505 Till (1st option).....	A-37-2	681
5506 Till (2nd option).....	A-37-2	682
5507 Till (3rd option).....	A-37-2	683
5508 Tilt direction of surface of landslide.....	A-17-3	17.52
5509 Tilt direction of surface of landslide, showing angle of tilt.....	A-17-3	17.53
5510 Times [font].....	38	n/a
5511 Times New Roman [font].....	38	n/a
5512 Toes of landslide.....	A-17-2	Sec. 17
5513 Tool marks.....	A-9-1	Sec. 9
5514 Topographic contours.....	A-30-1	Sec. 30.1
5515 Topographic depression contours (1st option), showing tick spacing of adjacent contours.....	A-30-1	30.1.10
5516 Topographic depression contours (2nd option), showing tick spacing of adjacent contours.....	A-30-1	30.1.20
5517 Topographic features.....	A-30-1	Sec. 30
5518 Toreva block, consisting of a relatively intact mass of displaced materials.....	A-17-3	17.62
5519 Town boundary.....	A-29-1	29.4
5520 Township and range line—Definite.....	A-31-1	31.1
5521 Township and range line—Location approximate.....	A-31-1	31.2
5522 Township boundary.....	A-29-1	29.4
5523 Township label.....	A-31-1	31.3
5524 Trace fossils.....	A-10-1	10.2.41
5525 Tracks.....	A-10-1	10.2.44

	<i>Page</i>	<i>Ref. No.</i>
5526		
5527	Traditional line symbol styles.....	24 Fig. 1
5528	Trail.....	A-28-1 28.15
5529	Transform faults	A-22-1 Sec. 22
5530	Transportation features	A-28-1 Sec. 28
5531	Trench (drawn to scale).....	A-19-3 19.3.8
5532	Trench (generalized trace).....	A-19-3 19.3.7
5533	Trenches	A-22-2 Sec. 22
5534	Trend of glacier	A-30-5 30.2.45
5535	Trend of permanent snowfield.....	A-30-5 30.2.45
5536	Triassic [geologic age symbol]	A-32-1 32.9
5537	Trilobites.....	A-10-1 10.2.8
5538	Trough line [concepts and definitions]	17 n/a
5539	Trough line of fold	A-5-13 5.10.11
5540	Trough, planetary.....	A-25-3 25.52
5541	Tuffaceous rock.....	A-37-3 711
5542	Tunnel (drawn to scale), as shown on subsurface exploration maps	A-19-5 19.4.9
5543	Tunnel entrance (1st option)	A-19-3 19.3.9
5544	Tunnel entrance (1st option), showing angle of inclination.....	A-19-3 19.3.13
5545	Tunnel entrance (2nd option)	A-19-3 19.3.14
5546	Tunnel entrance (2nd option), showing angle of inclination.....	A-19-3 19.3.18
5547	Type of rock [influencing color and pattern selection].....	34 n/a
5548	Type size [pertaining to map labeling]	39 n/a
5549	Type specifications [in this standard].....	40 n/a
5550	Type style [pertaining to map labeling]	39 n/a
5551		
5552	U/D [notation on fault].....	A-2-11 2.11.2
5553	U.S. route marker.....	A-28-1 28.17
5554	U.S. Virgin Islands [location map].....	A-34-2 Sec. 34.1
5555	Unconformable contact—Identity and existence certain, location accurate.....	A-1-2 1.1.25
5556	Unconformable contact—Identity and existence certain, location approximate.....	A-1-2 1.1.27
5557	Unconformable contact—Identity and existence certain, location concealed.....	A-1-2 1.1.31
5558	Unconformable contact—Identity and existence certain, location inferred	A-1-2 1.1.29
5559	Unconformable contact—Identity or existence questionable, location accurate.....	A-1-2 1.1.26
5560	Unconformable contact—Identity or existence questionable, location approximate.....	A-1-2 1.1.28
5561	Unconformable contact—Identity or existence questionable, location concealed.....	A-1-2 1.1.32
5562	Unconformable contact—Identity or existence questionable, location inferred	A-1-2 1.1.30
5563	Underclay.....	A-37-2 660
5564	Underground aqueduct.....	A-30-4 30.2.18
5565	Underground gas pipeline	A-30-6 30.3.23
5566	Underground oil pipeline	A-30-6 30.3.23

	<i>Page</i>	<i>Ref. No.</i>
5567		
5568	Underground or submerged water pipeline	A-30-4 30.2.20
5569	Underwater aqueduct.....	A-30-4 30.2.18
5570	Undulatory bedding	A-6-2 Sec. 6
5571	Unimproved road (Class 4).....	A-28-1 28.13
5572	Unit labels [concepts and definitions]	12 n/a
5573	Units for lineweights, lengths, and distances [in this standard]	40 n/a
5574	Univers [font]	38 n/a
5575	Unsurveyed shoreline	A-30-5 30.2.30
5576	Unused spring.....	A-26-4 26.2.2
5577	Unused water well.....	A-26-1 26.1.2
5578	Updates to this standard	4 n/a
5579	Uplift, local, intensely disturbed.....	A-23-1 23.12
5580	Use of patterns	36 n/a
5581	Utah [state location map]	A-34-2 Sec. 34.1
5582		
5583	Vein—Identity and existence certain, location accurate	A-19-1 19.1.1
5584	Vein—Identity and existence certain, location approximate	A-19-1 19.1.3
5585	Vein—Identity and existence certain, location concealed	A-19-1 19.1.5
5586	Vein—Identity or existence questionable, location accurate	A-19-1 19.1.2
5587	Vein—Identity or existence questionable, location approximate	A-19-1 19.1.4
5588	Vein—Identity or existence questionable, location concealed	A-19-1 19.1.6
5589	Vein-matter lithologic patterns	A-37-3 Sec. 37.2
5590	Vein, showing type of mineral occurrence.....	A-19-1 19.1.7
5591	Veinlet—Identity and existence certain, location accurate	A-19-1 19.1.1
5592	Veinlet—Identity and existence certain, location approximate	A-19-1 19.1.3
5593	Veinlet—Identity and existence certain, location concealed	A-19-1 19.1.5
5594	Veinlet—Identity or existence questionable, location accurate	A-19-1 19.1.2
5595	Veinlet—Identity or existence questionable, location approximate	A-19-1 19.1.4
5596	Veinlet—Identity or existence questionable, location concealed	A-19-1 19.1.6
5597	Veinlet, showing type of mineral occurrence.....	A-19-1 19.1.7
5598	Veins	A-19-1 Sec. 19.1
5599	Vent, large	A-18-3 18.56
5600	Vent, small.....	A-18-3 18.55
5601	Vermont [state location map]	A-34-2 Sec. 34.1
5602	Vertebrates.....	A-10-1 10.2.26
5603	Vertical bedding	A-6-1 6.3
5604	Vertical bedding, for multiple observations at one locality.....	A-6-1 6.8
5605	Vertical bedding, where top direction of beds is known from local features.....	A-6-1 6.14
5606	Vertical cleavage (generic or type unspecified)	A-7-1 7.3
5607	Vertical cleavage (generic or type unspecified), for multiple observations at one locality.....	A-7-1 7.6

	<i>Page</i>	<i>Ref. No.</i>
5608		
5609	Vertical continuous, penetrative foliation	A-8-3 8.3.18
5610	Vertical continuous, penetrative foliation, for multiple observations at one locality.....	A-8-3 8.3.21
5611	Vertical continuous, slaty cleavage	A-7-1 7.9
5612	Vertical continuous, slaty cleavage, for multiple observations at one locality	A-7-1 7.12
5613	Vertical cumulate foliation	A-8-1 8.2.12
5614	Vertical cumulate foliation, where top direction of layers is known from local features	A-8-1 8.2.15
5615	Vertical disjunctive, spaced cleavage.....	A-7-1 7.15
5616	Vertical disjunctive, spaced cleavage, for multiple observations at one locality	A-7-1 7.18
5617	Vertical disjunctive, spaced foliation	A-8-4 8.3.24
5618	Vertical disjunctive, spaced foliation, for multiple observations at one locality.....	A-8-4 8.3.27
5619	Vertical faults	A-2-1 Sec. 2.1
5620	Vertical flow banding, in igneous rock	A-8-1 8.2.4
5621	Vertical flow banding, in igneous rock, for multiple observations at one locality.....	A-8-1 8.2.7
5622	Vertical foliation in igneous rock.....	A-8-1 8.2.4
5623	Vertical foliation in igneous rock, for multiple observations at one locality	A-8-1 8.2.7
5624	Vertical generic (origin not known or not specified) foliation	A-8-1 8.1.3
5625	Vertical generic (origin not known or not specified) foliation, for multiple observations at one	
5626	locality	A-8-1 8.1.6
5627	Vertical lamination in igneous rock.....	A-8-1 8.2.4
5628	Vertical lamination in igneous rock, for multiple observations at one locality	A-8-1 8.2.7
5629	Vertical metamorphic foliation	A-8-3 8.3.3
5630	Vertical metamorphic foliation parallel to bedding.....	A-8-3 8.3.9
5631	Vertical metamorphic foliation parallel to bedding, where top direction of beds is known from	
5632	local features	A-8-3 8.3.12
5633	Vertical metamorphic foliation, for multiple observations at one locality.....	A-8-3 8.3.6
5634	Vertical mine shaft, as shown on smaller scale or general-purpose maps	A-19-4 19.3.35
5635	Vertical mine shaft at surface (drawn to scale), as shown on subsurface exploration maps.....	A-19-5 19.4.1
5636	Vertical or near-vertical axial surface of fold (1st option)	A-5-13 5.10.3
5637	Vertical or near-vertical axial surface of fold (2nd option)	A-5-13 5.10.4
5638	Vertical or near-vertical bed of economically important commodity (1st option).....	A-1-6 1.4.3
5639	Vertical or near-vertical bed of economically important commodity (2nd option).....	A-1-6 1.4.4
5640	Vertical or near-vertical bedding, as determined remotely or from aerial photographs.....	A-6-2 6.43
5641	Vertical or near-vertical bedding in crossbedded rocks	A-6-2 6.31
5642	Vertical or near-vertical clay bed (1st option)	A-1-6 1.4.3
5643	Vertical or near-vertical clay bed (2nd option)	A-1-6 1.4.4
5644	Vertical or near-vertical coal bed (1st option)	A-1-6 1.4.3
5645	Vertical or near-vertical coal bed (2nd option)	A-1-6 1.4.4
5646	Vertical or near-vertical contact (1st option)	A-1-6 1.4.3
5647	Vertical or near-vertical contact (2nd option)	A-1-6 1.4.4
5648	Vertical or near-vertical contorted bedding	A-6-2 6.26

	<i>Page</i>	<i>Ref. No.</i>
5649		
5650 Vertical or near-vertical crenulated bedding.....	A-6-2	6.26
5651 Vertical or near-vertical crinkled or deformed cumulate foliation.....	A-8-2	8.2.18
5652 Vertical or near-vertical crinkled or deformed eutaxitic foliation	A-8-2	8.2.26
5653 Vertical or near-vertical crinkled or deformed flow banding in igneous rock.....	A-8-1	8.2.9
5654 Vertical or near-vertical crinkled or deformed foliation in igneous rock	A-8-1	8.2.9
5655 Vertical or near-vertical crinkled or deformed lamination in igneous rock.....	A-8-1	8.2.9
5656 Vertical or near-vertical crinkled or deformed metamorphic foliation.....	A-8-3	8.3.15
5657 Vertical or near-vertical crinkled or deformed tectonic foliation	A-8-3	8.3.15
5658 Vertical or near-vertical dike (1st option).....	A-1-6	1.4.3
5659 Vertical or near-vertical dike (2nd option).....	A-1-6	1.4.4
5660 Vertical or near-vertical disjunctive, asymmetric (S-shaped, counterclockwise sense of shear)		
5661 crenulation cleavage.....	A-7-2	7.27
5662 Vertical or near-vertical disjunctive, asymmetric (S-shaped, counterclockwise sense of shear)		
5663 crenulation cleavage, for multiple observations at one locality	A-7-2	7.30
5664 Vertical or near-vertical disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation		
5665 cleavage.....	A-7-2	7.33
5666 Vertical or near-vertical disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation		
5667 cleavage, for multiple observations at one locality	A-7-2	7.36
5668 Vertical or near-vertical disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation		
5669 foliation	A-8-4	8.3.42
5670 Vertical or near-vertical disjunctive, asymmetric (Z-shaped, clockwise sense of shear) crenulation		
5671 foliation, for multiple observations at one locality.....	A-8-4	8.3.45
5672 Vertical or near-vertical disjunctive, asymmetric (S-shaped, counterclockwise sense of shear)		
5673 crenulation foliation.....	A-8-4	8.3.36
5674 Vertical or near-vertical disjunctive, asymmetric (S-shaped, counterclockwise sense of shear)		
5675 crenulation foliation, for multiple observations at one locality.....	A-8-4	8.3.39
5676 Vertical or near-vertical disjunctive, symmetric crenulation cleavage.....	A-7-1	7.21
5677 Vertical or near-vertical disjunctive, symmetric crenulation cleavage, for multiple observations		
5678 at one locality	A-7-1	7.24
5679 Vertical or near-vertical disjunctive, symmetric crenulation foliation	A-8-4	8.3.30
5680 Vertical or near-vertical disjunctive, symmetric crenulation foliation, for multiple observations		
5681 at one locality	A-8-4	8.3.33
5682 Vertical or near-vertical eutaxitic foliation.....	A-8-2	8.2.21
5683 Vertical or near-vertical eutaxitic foliation, for multiple observations at one locality	A-8-2	8.2.24
5684 Vertical or near-vertical fault (1st option).....	A-2-11	2.11.10
5685 Vertical or near-vertical fault (2nd option).....	A-2-11	2.11.11
5686 Vertical or near-vertical generic (origin or type not known or not specified) lineation or linear		
5687 structure (1st option)	A-9-1	9.7
5688 Vertical or near-vertical generic (origin or type not known or not specified) lineation or linear		
5689 structure (2nd option)	A-9-1	9.8
5690 Vertical or near-vertical gneissic layering.....	A-8-5	8.3.48

	<i>Page</i>	<i>Ref. No.</i>
5691		
5692	Vertical or near-vertical gneissic layering, for multiple observations at one locality	A-8-5 8.3.51
5693	Vertical or near-vertical graded bedding	A-6-2 6.28
5694	Vertical or near-vertical key bed (1st option).....	A-1-6 1.4.3
5695	Vertical or near-vertical key bed (2nd option).....	A-1-6 1.4.4
5696	Vertical or near-vertical mineralized stringer (1st option).....	A-19-1 19.1.10
5697	Vertical or near-vertical mineralized stringer (2nd option).....	A-19-1 19.1.11
5698	Vertical or near-vertical mylonitic foliation	A-8-5 8.3.57
5699	Vertical or near-vertical mylonitic foliation, for multiple observations at one locality	A-8-5 8.3.60
5700	Vertical or near-vertical undulatory bedding	A-6-2 6.26
5701	Vertical or near-vertical undulatory gneissic layering.....	A-8-5 8.3.54
5702	Vertical or near-vertical vein (1st option).....	A-19-1 19.1.10
5703	Vertical or near-vertical vein (2nd option).....	A-19-1 19.1.11
5704	Vertical or near-vertical veinlet (1st option).....	A-19-1 19.1.10
5705	Vertical or near-vertical veinlet (2nd option).....	A-19-1 19.1.11
5706	Vertical or near-vertical warped bedding.....	A-6-2 6.26
5707	Vertical or subvertical joint (1st option).....	A-4-1 4.2.5
5708	Vertical or subvertical joint (2nd option).....	A-4-1 4.2.6
5709	Vertical tectonic foliation.....	A-8-3 8.3.3
5710	Vertical tectonic foliation, for multiple observations at one locality	A-8-3 8.3.6
5711	Vertical tectonic foliation parallel to bedding	A-8-3 8.3.9
5712	Vertical tectonic foliation parallel to bedding, where top direction of beds is known from local	
5713	features.....	A-8-3 8.3.12
5714	Vertical (top direction to left) bedding, where top direction of beds is known from local features,	
5715	for multiple observations at one locality	A-6-1 6.20
5716	Vertical (top direction to right) bedding, where top direction of beds is known from local features,	
5717	for multiple observations at one locality	A-6-1 6.19
5718	Very small dome, planetary (not mapped to scale)	A-25-4 25.76
5719	Very small shield, planetary (not mapped to scale).....	A-25-4 25.76
5720	Very small tholi, planetary (not mapped to scale).....	A-25-4 25.88
5721	Very small volcanic construct, planetary (not mapped to scale)	A-25-4 25.76
5722	Violet [spot color]	A-v Table 3
5723	Virginia [state location map].....	A-34-2 Sec. 34.1
5724	Vitrophyre	A-37-3 731
5725	Volcanic agglomerate.....	A-37-3 715
5726	Volcanic breccia	A-37-3 715
5727	Volcanic breccia and tuff.....	A-37-3 714
5728	Volcanic crater—Identity and existence certain, location accurate.....	A-18-1 18.1
5729	Volcanic crater—Identity and existence certain, location concealed.....	A-18-1 18.5
5730	Volcanic crater—Identity or existence certain, location approximate.....	A-18-1 18.3
5731	Volcanic crater—Identity or existence questionable, location accurate.....	A-18-1 18.2

	<i>Page</i>	<i>Ref. No.</i>
5732		
5733	Volcanic crater—Identity or existence questionable, location approximate..... A-18-1	18.4
5734	Volcanic crater—Identity or existence questionable, location concealed..... A-18-1	18.6
5735	Volcanic crater, showing low point of crater A-18-1	18.7
5736	Volcanic edifice—Accurately located A-22-2	22.33
5737	Volcanic edifice—Approximately located A-22-2	22.34
5738	Volcanic features A-18-1	Sec. 18
5739	Volcanic fissure..... A-18-2	18.41
5740	Volcanic fissure where lava has been emitted A-18-2	18.43
5741	Volcanic ridge—Accurately located A-22-2	22.33
5742	Volcanic ridge—Approximately located A-22-2	22.34
5743	Volcano, planetary, having summit crater..... A-25-5	25.112
5744	Volcano, planetary, without summit crater..... A-25-5	25.113
5745		
5746	Warped bedding A-6-2	Sec. 6
5747	Washes A-30-4	Sec. 30.2
5748	Washington [state location map] A-34-2	Sec. 34.1
5749	Water [as fill]..... A-30-5	30.2.29
5750	Water gaging station, type of measurement unspecified A-26-5	26.3.1
5751	Water gaging stations A-26-5	Sec. 26.3
5752	Water-level contour (index), showing altitude at which water level would have stood in tightly	
5753	cased wells [date]—Accurately located A-26-7	26.5.13
5754	Water-level contour (index), showing altitude at which water level would have stood in tightly	
5755	cased wells [date]—Approximately located A-26-7	26.5.14
5756	Water-level contour (intermediate), showing altitude at which water level would have stood in	
5757	tightly cased wells [date]—Accurately located..... A-26-7	26.5.15
5758	Water-level contour (intermediate), showing altitude at which water level would have stood in	
5759	tightly cased wells [date]—Approximately located..... A-26-7	26.5.16
5760	Water-quality-zone contour (index), showing altitude of top or base of, or horizon within, [type	
5761	of] water-quality zone or water in aquifer [date]—Accurately located A-26-7	26.5.17
5762	Water-quality-zone contour (index), showing altitude of top or base of, or horizon within, [type	
5763	of] water-quality zone or water in aquifer [date]—Approximately located A-26-7	26.5.18
5764	Water-quality-zone contour (intermediate), showing altitude of top or base of, or horizon within,	
5765	[type of] water-quality zone or water in aquifer [date]—Accurately located A-26-7	26.5.19
5766	Water-quality-zone contour (intermediate), showing altitude of top or base of, or horizon within,	
5767	[type of] water-quality zone or water in aquifer [date]—Approximately located A-26-7	26.5.20
5768	Water-table contour (index), showing altitude of unconfined water table [date]—Accurately	
5769	located..... A-26-7	26.5.9
5770	Water-table contour (index), showing altitude of unconfined water table [date]—Approximately	
5771	located..... A-26-7	26.5.10
5772	Water-table contour (intermediate), showing altitude of unconfined water table [date]—	
5773	Accurately located..... A-26-7	26.5.11

	<i>Page</i>	<i>Ref. No.</i>
5774		
5775	Water-table contour (intermediate), showing altitude of unconfined water table [date]—	
5776	Approximately located.....	A-26-7 26.5.12
5777	Water well, as shown on topographic maps or on general-purpose or smaller scale maps.....	A-30-6 30.3.10
5778	Water well, type unspecified.....	A-26-1 26.1.1
5779	Water wells.....	A-26-1 Sec. 26.1
5780	Watershed basin boundary.....	A-26-9 26.7.1
5781	Watershed subbasin boundary.....	A-26-9 26.7.2
5782	Weather station measuring evaporation, equipped with a recorder.....	A-27-1 27.8
5783	Weather station measuring evaporation, equipped with a telephone or radio.....	A-27-1 27.7
5784	Weather station measuring humidity, equipped with a recorder.....	A-27-1 27.12
5785	Weather station measuring humidity, equipped with a telephone or radio.....	A-27-1 27.11
5786	Weather station measuring precipitation, equipped with a recorder.....	A-27-1 27.6
5787	Weather station measuring precipitation, equipped with a telephone or radio.....	A-27-1 27.5
5788	Weather station measuring solar radiation, equipped with a recorder.....	A-27-1 27.14
5789	Weather station measuring solar radiation, equipped with a telephone or radio.....	A-27-1 27.13
5790	Weather station measuring temperature, equipped with a recorder.....	A-27-1 27.10
5791	Weather station measuring temperature, equipped with a telephone or radio.....	A-27-1 27.9
5792	Weather station measuring wind velocity, equipped with a recorder.....	A-27-1 27.16
5793	Weather station measuring wind velocity, equipped with a telephone or radio.....	A-27-1 27.15
5794	Weather station, type of measurement unspecified.....	A-27-1 27.1
5795	Weather stations.....	A-27-1 Sec. 27
5796	"Web-safe" color [concepts and definitions].....	41 n/a
5797	Well location for hydrocarbon exploration or exploitation.....	A-19-6 19.5.10
5798	Well used for collection of water data.....	A-26-1 26.1.6
5799	Well used for domestic-water supply.....	A-26-1 26.1.7
5800	Well used for industrial-water supply.....	A-26-2 26.1.34
5801	Well used for irrigation-water supply.....	A-26-2 26.1.25
5802	Well used for public-water supply.....	A-26-3 26.1.43
5803	Well used for stock-water supply.....	A-26-1 26.1.16
5804	Wells drilled for hydrocarbon exploration or exploitation.....	A-19-6 Sec. 19.5
5805	Wells, gas.....	A-19-8 Sec. 19.5
5806	Wells, oil.....	A-19-8 Sec. 19.5
5807	Wells, oil and gas.....	A-19-9 Sec. 19.5
5808	Wells, water.....	A-26-1 Sec. 26.1
5809	West Virginia [state location map].....	A-34-2 Sec. 34.1
5810	Wetland.....	A-30-5 30.2.46
5811	Wind streaks, planetary.....	A-25-3 25.68
5812	Windmill, as shown on topographic maps or on general-purpose or smaller scale maps.....	A-30-6 30.3.8
5813	Winze (drawn to scale), as shown on subsurface exploration maps.....	A-19-5 19.4.6
5814	Winze extending through level (drawn to scale), as shown on subsurface exploration maps.....	A-19-5 19.4.7

	<i>Page</i>	<i>Ref. No.</i>
5815		
5816	Wisconsin [state location map]	A-34-2 Sec. 34.1
5817	"Within zone of confidence" [concepts and definitions]	29 n/a
5818	Wood	A-10-1 10.2.34
5819	Workings (at surface, or projected to surface)	A-19-2 Sec. 19.2
5820	Workings (drawn to scale), as shown on subsurface exploration maps	A-19-5 19.4.10
5821	Workings (subsurface), as shown on subsurface exploration maps	A-19-5 Sec. 19.4
5822	Wrinkle ridge, planetary	A-25-2 25.37
5823	Wyoming [state location map]	A-34-2 Sec. 34.1
5824		
5825	Y [abbreviation]	A-v Table 2
5826	Y/O [notation on contact]	A-1-6 1.4.9
5827	Younger glacial groove—Showing general bearing	A-13-2 13.29
5828	Younger glacial groove—Showing measured bearing	A-13-2 13.30
5829	Younger glacial groove, flow direction unknown—Showing general bearing	A-13-2 13.33
5830	Younger glacial groove, flow direction unknown—Showing measured bearing	A-13-2 13.34
5831	Younger glacial groove (length mapped to scale)	A-13-2 13.37
5832	Younger glacial groove (length mapped to scale), flow direction unknown	A-13-2 13.38
5833	Younger glacial striation—Showing general bearing	A-13-2 13.29
5834	Younger glacial striation—Showing measured bearing	A-13-2 13.30
5835	Younger glacial striation, flow direction unknown—Showing general bearing	A-13-2 13.33
5836	Younger glacial striation, flow direction unknown—Showing measured bearing	A-13-2 13.34
5837	Younger glacial striation (length mapped to scale)	A-13-2 13.37
5838	Younger glacial striation (length mapped to scale), flow direction unknown	A-13-2 13.38
5839		
5840	Zeolitic rock	A-37-3 716
5841	Zone of altered rock (1st option)	A-19-1 19.1.14
5842	Zone of altered rock (2nd option)	A-19-1 19.1.15
5843	Zone of altered rock, showing high level of mineralization	A-19-1 19.1.16
5844	Zone of altered rock, showing low level of mineralization	A-19-1 19.1.17
5845	Zone of broken rock around fault	A-2-16 2.14.4
5846	Zone of broken rock within fault	A-2-16 2.14.3
5847	Zone of confidence [concepts and definitions]	28 n/a
5848	Zone of confidence examples for planar, linear, and point features	29 Fig. 3
5849	Zone of mineralized rock (1st option)	A-19-1 19.1.14
5850	Zone of mineralized rock (2nd option)	A-19-1 19.1.15
5851	Zone of mineralized rock, showing high level of mineralization	A-19-1 19.1.16
5852	Zone of mineralized rock, showing low level of mineralization	A-19-1 19.1.17
5853	Zone of sheared rock within fault	A-2-16 2.14.2